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The OIL AND GAS JOURNAL

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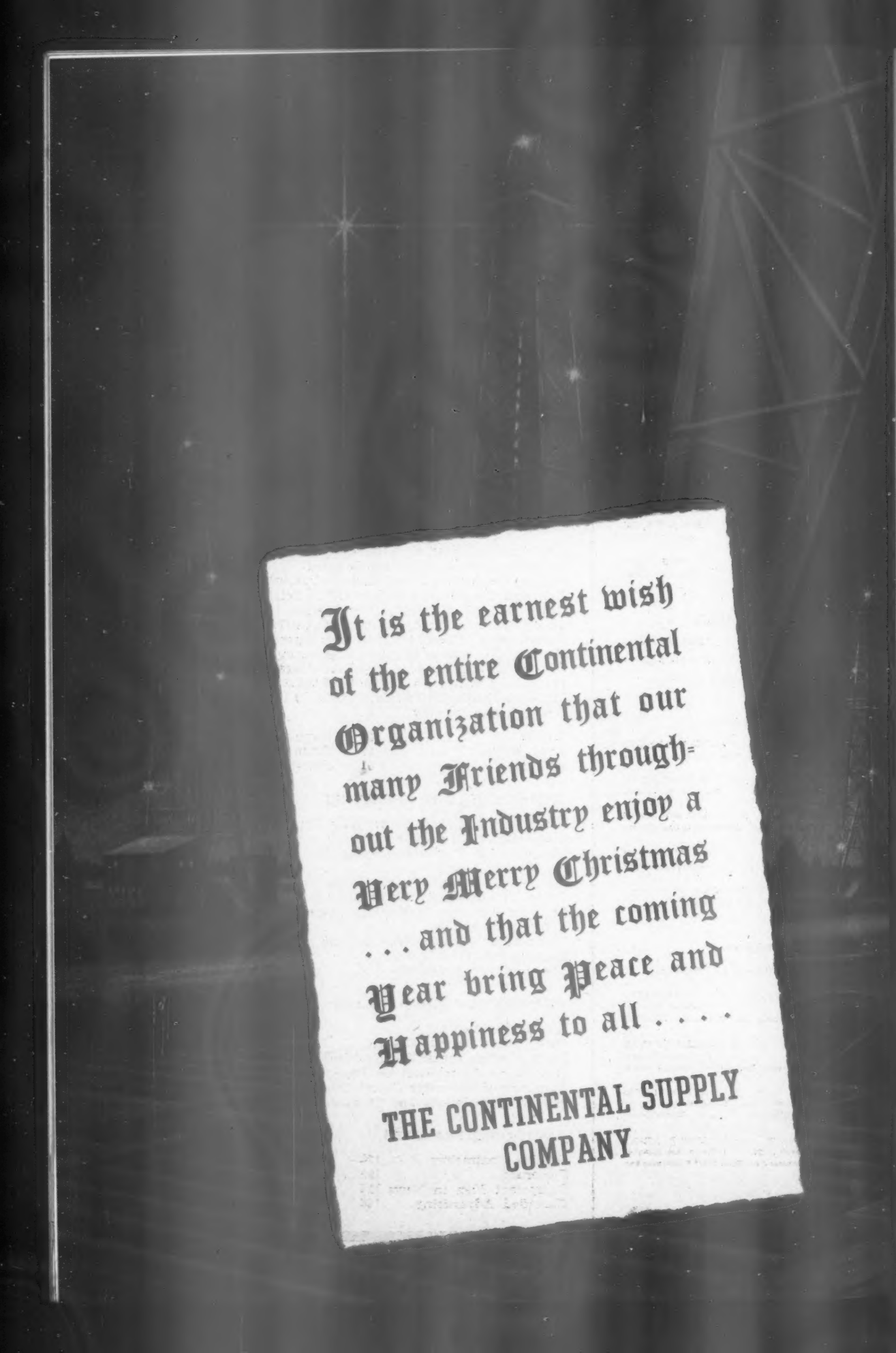
It is the earnest wish
of the entire Continental
Organization that our
many Friends through-
out the Industry enjoy a
Very Merry Christmas
... and that the coming
Year bring Peace and
Happiness to all ....
THE CONTINENTAL SUPPLY
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Trends

Crude-Oil Production
By States—Page 110

CRUDE-OIL STOCKS 220,258,000 bbl. as of December 9—down 1,333,000 bbl. One year ago 240,148,000 bbl.

GASOLINE STOCKS 80,880,000 bbl. as of December 9—up 454,000 bbl. One year ago 70,855,000 bbl.

RESIDUAL FUEL-OIL STOCKS 60,458,000 bbl. as of December 9—down 1,269,000 bbl. One year ago 59,154,000 bbl.

GAS OIL AND DISTILLATE STOCKS 44,436,000 bbl. as of December 9—down 1,396,000 bbl. One year ago 44,652,000 bbl.

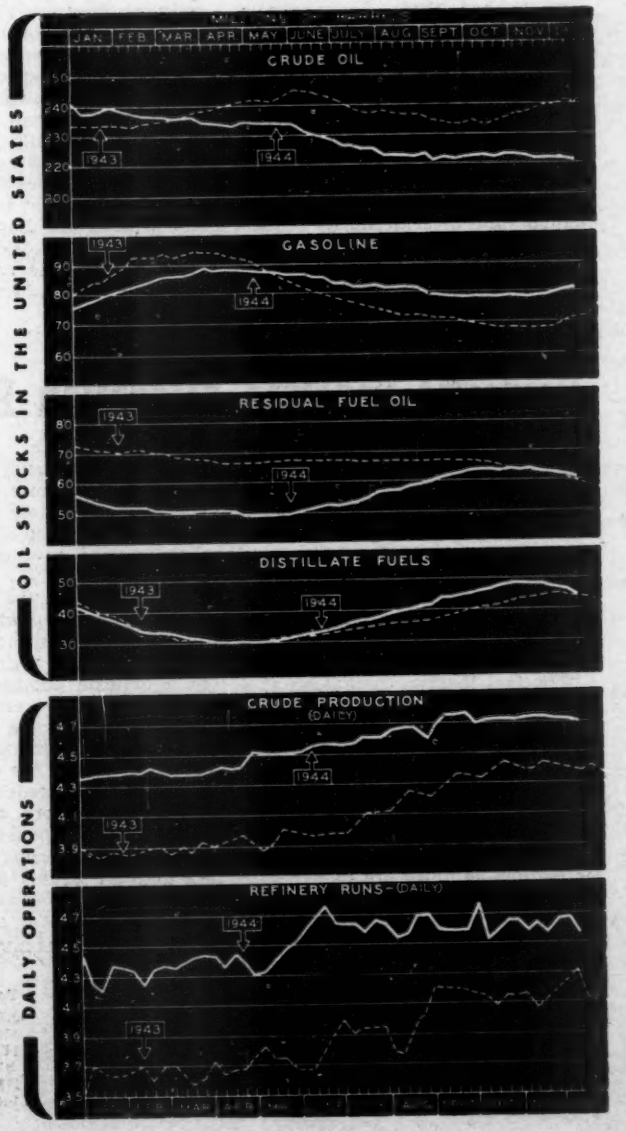
CRUDE-OIL PRODUCTION 4,700,030 bbl. as of December 16—down 5,420 bbl. One year ago 4,401,290.

REFINERY RUNS 4,552,000 bbl. daily week ended December 9—down 141,000 bbl. Year ago 4,162,000 bbl.

FINANCIAL writers in recent weeks have been calling attention to the increased earnings of the petroleum industry this year as revealed in statements of the larger operators, whose stocks are quoted on the major exchanges. They point out that the substantial increases in some instances and the more modest gains as a group are in contrast with the general trends in other industries, where earnings are approximately the same as in 1943 or lower. The reports and the public comments have been a matter of concern to economists, who realize that unwanted trends in future developments can result from erroneous interpretations of current operations. Generally the financial comparisons have failed to point out that the greater earnings are entirely due to expanded volume in an operating situation peculiar to the petroleum industry.

JOHN D. GILL, a widely known economist, with many years of experience as an executive of a major oil company, pointed out in a statement last week that current earnings, even when based on sound long-range operating conditions, are not excessive and do not indicate "war profiteering." In an analysis of industrial earnings over a 10-year period he shows that returns of the oil industry have been substantially less, not more, than the average of "all industry" and "manufacturing and trading." The 10-year average on net worth up to 1944 was: All industry, 6.75 per cent; manufacturing and trading, 8.87 per cent; oil industry, 6.63 per cent. For the last 5 years the earnings respectively were: 8.14, 10.2 and 7.2 per cent. Last year's earnings of the three classifications were: 8.7, 9.9 and 8.3 per cent.

GILL concludes: "It is doubly unfortunate that there is probably no general realization that to be far ahead of the rest of industry earningwise is an unusual experience for the oil industry. In each of the last 5 years the oil industry's rate of return on net worth has been lower than that of all industry, and not in the last 10 years has the oil industry approached manufacturing and trading. Thus it appears that it is only now, after 3 years of war, that the petroleum industry is beginning to catch up to the good earnings which other industries have been enjoying over the whole period, and not even now has the gap been completely closed."



OPA Appointing Advisory Group To Study Oil-Production Costs

WASHINGTON.—The Office of Price Administration is appointing an oil production industry advisory committee on a nationwide basis and will undertake a study of the cost of producing crude oil, as recommended in the recent report of the Patman small business committee of the House.

This report was never formally submitted to OPA since it was made to the speaker, but OPA will attempt to comply with it if possible although it believes that many of the criticisms are unfounded.

OPA has had regional crude-oil committees in each of the five PAW districts but three never recommended anything, one asked only a general crude-price increase without any supporting data, and only the California committee submitted evidence resulting in an increased price for certain crude. OPA contends that under its law it need not appoint a general advisory committee until asked by the industry, and that in spite of criticism no request was received until 2 weeks ago when three producers suggested one be created to study production costs.

As a result, OPA is now seeking suggestions from producers as to the size, basis of representation, and personnel of the advisory committee. First matter to lay before the new committee will be the problem of making a cost study. OPA has already prepared a tentative questionnaire form for basis of discussion. The Patman committee suggested that actual crude-production costs could be obtained readily by sampling a small segment of the industry, and the committee will be asked how to select representative producers and how cost data should be gathered and interpreted.

Later OPA will create a refining industry advisory committee which probably will consider a study of refining costs, particularly if a general increase in crude prices should become a possibility. OPA does not agree with Patman committee estimates of generally high profits of refiners but will ask the advisory committee to check its data and also to determine what is a marginal refinery since the Patman committee recommended subsidizing marginal refineries in case crude prices are raised and products prices held stationary.

Domestic Gasoline Allocation Reduced

WASHINGTON. — An average of 1,144,000 bbl. of gasoline daily has been allocated to essential industrial and civilian agencies for the first quarter of 1945, a decrease of 29,000 bbl. from the final quarter of this year. The reduction, explained Petroleum Administrator Harold L. Ickes, represents the seasonal decline in automotive gasoline.

"The fact that we have been able to make this quantity available should not be interpreted as meaning that gasoline is abundant," cautioned Ralph K. Davies, deputy petroleum administrator.

"On the contrary," he continued, "the position is not a comfortable one because transportation facilities for civilian supplies are barely sufficient to support the program. However, the oil industry and the transportation companies can, by skillful management, attain this objective, barring unforeseen accidents or further upward revisions in military requirements.

"By reason of the enormous size of the present military demand and the transportation facilities required in meeting it we are operating today on a delicate balance. The quantities allocated for civilian use represent the maximum possible of delivery where both supply and transportation factors are considered and must not be exceeded.

"We need more than ever the wholehearted cooperation of the public in considering gasoline, if we are to avert serious dislocations this winter."

1945 FIRST QUARTER AUTOMOTIVE GASOLINE ALLOCATIONS
(Figures in barrels daily)

	ODT	WFA	OCR	Total	Change
District 1	346,000	11,000	23,000	380,000	— 3,000
District 2	372,000	47,000	22,000	441,000	—24,000
District 3	120,000	23,000	6,000	149,000	+ 3,000
District 4	27,000	3,000	1,000	31,000	— 2,000
District 5	121,000	10,000	12,000	143,000	— 3,000
	986,000	94,000	64,000	1,144,000	—29,000

January Production Quotas Increased 14,400 Bbl. Daily

WASHINGTON. — Petroleum Administration for War has certified January production rates totaling 5,040,800 bbl. daily of all petroleum liquids, an increase of 14,400 bbl. over the December daily rate.

The rate in District 1 is reduced slightly, while that in District 4 remains practically unchanged. The District 2 daily rate is a net increase of 2,000 bbl. over December, in spite of decreases in Illinois, Indiana and Ohio. The withdrawal rate of West Edmond field has been reduced 25 per cent but additional wells will overbalance this.

In California the increase over December is 10,800 bbl. daily, of which 9,000 will be crude and 1,800 natural gasoline and condensate. The California figure is also adjusted by shifting into the condensate column 6,000 bbl. daily production from Paloma field previously classed as crude.

The District 3 rate is 2,800 bbl. daily above December, and for the first time includes Alabama with 300 bbl. Texas' rate was reduced 9,000 bbl. daily, all in West Texas sour crude, resulting in producing sweet crude fields in several areas at higher than maximum efficient rates.

The following are certified January production rates by states:

	Certified total petroleum liquids	Estimated natural gaso. and condensate
District 1—		
New York	13,000	.....
Pennsylvania	40,400	1,400
West Virginia	15,000	6,800
Total	68,400	8,200
District 2—		
Illinois	212,000	12,000
Indiana	12,500	.....
Kansas	280,000	6,000
Kentucky	34,800	2,800
Michigan	47,600	600
Nebraska	1,200	.....
Ohio	8,350	350
Oklahoma	378,000	26,000
Total	974,450	47,750
District 3—		
Alabama	300	.....
Arkansas	84,900	4,900
Louisiana	391,000	36,000
Mississippi	53,000	.....
New Mexico	110,600	5,600
Texas	2,274,000	150,000
Total	2,913,800	196,500
District 4—		
Colorado	9,500	.....
Montana	23,350	350
Wyoming	103,500	3,500
Total	136,350	3,850
District 5—		
California	947,800	59,800
Total United States	5,040,800	316,100

Passenger Cars Receive Bulk of ODT's Total Gasoline Supply

WASHINGTON. — First quarter 1945 automotive gasoline allocations for all forms of domestic transportation will amount to 986,000 bbl. daily, the Office of Defense Transportation announced this week.

ODT's claims were met by the Petroleum Administration for War except on the East and West Coasts. Continuing high military demands and shortages of transportation facilities, PAW said, kept East Coast allocations 9,000 bbl. daily short of claims and West Coast quotas 2,000 bbl. below certified requirements.

ODT allocations, by users, and in barrels daily, follow:

	Dist. 1	Dist. 2	Dist. 3	Dist. 4	Dist. 5
Passenger cars	181,566	221,161	58,969	14,105	76,611
Trucks	120,544	126,705	51,314	11,321	35,553
Local commercial passenger transportation and intercity buses	36,824	22,012	7,228	1,449	5,176
Water transportation	6,716	1,847	2,239	none	3,410
Railroads	350	275	250	125	250
Total	346,000	372,000	120,000	27,000	121,000

Order Demanding That Republic Buy Peerless Gas Starts Fight

OKLAHOMA CITY.—An order issued December 16 by the state Corporation Commission directing Republic Natural Gas Co. to purchase the natural gas from a well owned by Peerless Oil & Gas Co., in the Guymon sector of the Hugoton field, has precipitated a controversy which is expected to reach the Supreme Court of Oklahoma. According to W. J. Armstrong, member of the commission, the order, as written, "is almost certain to knock out our ratable-taking laws and leave the big companies in absolute control, with no chance for the little fellow."

Armstrong, who refused to sign the order, said he agreed with the two other commissioners that the little producer should be protected in his right to get his gas to market, but he objected to the form of the order.

Order Described as Trail Blazer

Ray O. Weems, vice chairman of the commission, described the order as a trail blazer for the little producer who has no pipe line and no outlet for the gas he produces from one or two wells. Signing the order with Weems was Reford Bond, chairman.

Testimony was given to the effect that Republic has a pipe line near the well, but that it also owns royalty under three quarter-sections to which the Peerless well presumably was attached to create a 640-acre drilling unit, and that Republic had not agreed to communization of the leases. Peerless was granted a PAW-WPM exception to the spacing order.

Floyd Green, general attorney for the commission, said the effect of the order would be to prevent the big companies with their pipe lines from draining the gas field to the exclusion of the little producers.

Armstrong contended Republic spent money to build gathering lines and it had offered to transport the products of the Peerless company free to some distributing company. Peerless, he said, had spent nothing for gathering lines. He indicated he would write a dissenting opinion within a few days.

Tennessee Rates to Be Investigated by FPC

WASHINGTON. — The Federal Power Commission has ordered an investigation of the rates charged by Tennessee Gas & Transmission Co. for natural gas sold to other gas companies for distribution in Kentucky, West Virginia, Ohio, Pennsylvania, and New York.

The investigation will also cover the rates charged by the Chicago Corp., parent company and sole supplier of Tennessee's gas in Nueces, Jim Wells and Kleberg counties, Texas, provided it can be shown that the corporation is an interstate natural gas company subject to the commission's jurisdiction. The investigation was ordered because United Fuel Gas Co. filed rate schedules involving large increases giving as the reason the high prices charged it by Tennessee.

Navy Seeks to Acquire Leases in Reserve No. 1

WASHINGTON. — The Navy Department will begin negotiations with three lessees in Naval Petroleum Reserve No. 1 to acquire wells draining oil from Navy holdings.

A limitation of $400,000 was set by the House of Representatives as a contingency fund for the purpose, the money authorized in the first 1945 deficiency bill from previously appropriated money. The sale figure is expected to be well under that, the Navy said.

The three leases, located in the Tupman area of the eastern end of the Elk Hills field, are held by Richfield Oil Co., Union Oil Co. of California, and Blanck & McDonald Co.

Acquisition of these leases, Capt. W. G. Greenman of the Office of Naval Petroleum Reserves said, will make it possible to put all oil operations in Elk Hills under the Navy-Standard Oil Co. of California unit contract.

NEXT WEEK . . .

The INTERNATIONAL Number

Charts and graphs in four colors will show outstanding foreign oil provinces and trends in global developments.

Geological maps in four colors and discussion of salient features of the more important sedimentary beds will be presented on all Latin-American countries.

Operating and development articles will spotlight activities in all substantial producing countries outside the United States.

State Department Studying Proposed Oil-Treaty Changes

by Henry D. Ralph

WASHINGTON.—The revised draft of the Anglo-American oil agreement prepared by the Petroleum Industry War Council is receiving generally sympathetic consideration from State Department officials who have studied it so far.

The department is fulfilling its word to the industry to give careful study to any constructive criticisms and suggested changes, and takes the view that the PIWC draft was submitted in good faith in an attempt to meet industry objections to the original.

Officially the draft is still in the hands of Charles B. Rayner, special advisor on petroleum, for preparation of recommendations to the secretary. Rayner is making a careful analysis of the draft and comparison with the original language in an attempt to discover any real points of difference in intent and effect, and in this he is conferring with the department lawyers and oil experts in other federal agencies. He also plans to hold informal discussions with several oil industry men, particularly PIWC members, as to industry's interpretation of the proposed language.

The general impression of State Department officials is that the PIWC draft means just about what the original text intended to mean, but just as the industry thought the original meant more than it intended so the department wants to be sure the revision does not mean less than it appears to say.

Revisions Probably Acceptable

Most of the revision, it now appears, probably can be accepted by the government, but several points must be cleared up to be sure that PIWC's intentions are completely understood. One of these is the revised definition of the United Kingdom in which PIWC excluded crown colonies. The principal effect of this is to throw Trinidad oil into world trade whereas the original draft would treat it as internal or coastwise movement, and the industry's purpose in this has not been made clear. Since this point might be of vital concern to the British, the department wants to understand its implications fully before reopening negotiations.

Another questionable point is the PIWC provision that compliance with recommendations of the international petroleum commission will not be considered in violation of laws dealing with restraint of trade. Since this is an internal domestic matter it is questionable whether it should be in a treaty applying to both nations, so the department may seek some other means to accomplish this aim.

Future procedure in dealing with the treaty has not yet been decided. Quite possibly the department's attorneys may want to revise the PIWC phraseology to conform more nearly to established diplomatic usage, and PIWC probably will be asked to accede to such changes. If it appears that the revision is quite different from the original the treaty may be withdrawn from the Senate and the British invited to reopen formal negotiations by reconstituting its official delegation. It is more probable that the treaty will be left with the Senate while language changes are discussed with the British informally through regular diplomatic channels and if an agreement can be reached in this manner a substitute or series of amendments will be sent to the Senate with a request for ratification in the revised form.

Regardless of procedure, however, department officials are hopeful that an agreement acceptable to all concerned can be worked out on the basis of the PIWC draft without too much delay, and that it will be ratified by both governments. There is every intention of bringing this about because, as several high government officials have stated publicly, the Anglo-American oil agreement is the first of a projected series of international accords for stabilizing postwar trade and promoting international collaboration, and if the two countries are unable to get together on such a relatively simple matter as the procedure relating to oil, there is little hope for cooperation on other subjects.

Inquiry at the State Department also developed the fact that there is no intention of throwing the international petroleum commission into the United Nations social and economic council proposed in the Dumbarton Oaks peace plan. This council would not have any of the attributes of a world state but would simply discuss over-all policies. Where the situation warranted, each member nation would then give voting instructions to its delegates on the petroleum commission and any other special international bodies. Thus the petroleum commission would remain autonomous and would not become a minor adjunct of the United Nations organization, although it and all similar bodies would have their policies coordinated through instructions from member governments.

S.A.E. 1945 Annual Meeting Features War Engineering

NEW YORK.—Virtually the gamut of wartime automotive engineering needs is covered in the program for the 1945 annual meeting of the Society of Automotive Engineers, which is scheduled for January 8 through 12, in the Book-Cadillac Hotel at Detroit.

Numerous papers will be concerned with wartime automotive engineering developments, including water-alcohol injection, heated wings for aircraft, methods for calculating torsional vibration, induction heat treatment of internal surfaces, trends in airport design, and basic factors of helicopter design.

A portion of the program will be devoted to postwar application of wartime engineering progress, with C. F. Kettering, of General Motors Research Laboratories Division, speaking on "Fuels and Engines for Higher Power and Better Efficiency."

Three postwar symposiums have been organized for the meeting. A symposium on body designs for postwar automobiles will outline needs as indicated by users.

A symposium on postwar local air transport will present representatives of aircraft manufacturers and operators and of other business enterprises discussing the type of planes required. The third symposium, concerned with aircraft cockpit engineering, is designed to produce data on ways and means of equipping the plane's control center for the most convenient and efficient operation.

A substantial proportion of the program is given over to technical papers on processing and applications of automotive materials, such as synthetic rubber, fabrics and steel.

Considerable time on the program will be devoted to standardization in the manufacture of both land and air vehicles.

THIS WEEK

PRODUCTION—January production quotas assigned oil states raises national requirements 14,400 bbl. daily. . . . California raised 10,800 bbl., District 3 increased 2,800. . . . Texas' assignment cut 9,000 bbl. from December, all in West Texas sour crude areas. . . . National total of 5,040,800 bbl. daily needed next month includes 316,100 bbl. of condensate, natural gasoline and allied products, up 11,800 from December. . . . ¶Current crude-oil output of 4,700,030 daily is 24,670 bbl. below next month's needs.

TRANSPORTATION—Overland movement of petroleum via pipe lines, railroads and barges averaging 3,000,000 bbl. daily. . . . ¶Diversion of 600 tank cars to movement of raw materials for munitions cuts number available to oil industry. . . . ¶Twenty-two tankers delivered last month, contracts awarded for four more. . . . ¶Tank-car deliveries to East Coast increase to 531,440 bbl. daily. . . . ¶Army diverts 500,000 drums at PAW request for box-car shipment of kerosene to New England.

DRILLING—Completions hit year's peak of 593 wells in a week, lifting 1944 total to 23,807. . . . ¶Industry assured of exceeding minimum PAW request for 24,000 completions. . . . ¶New oil wells total 310 and gas completions 73 for the week. . . . ¶Wildcat completions slump, probably because of adverse weather conditions.

SUPPLIES—PAW allocates 1,144,000 bbl. of gasoline daily for civilian and essential industry operation first quarter next year. . . . Seasonal declines in requirements account for net decrease of 29,000 bbl. daily. . . . Bulk of Office of Defense Transportation quota goes to passenger cars with trucks and commercial vehicles crowding for supremacy in some districts. . . . ¶Draft on crude-oil stocks continued, falling to a new low of 220,258,000 bbl. . . . Domestic crude stocks dip 1,225,000 bbl., foreign inventories off 108,000. . . .

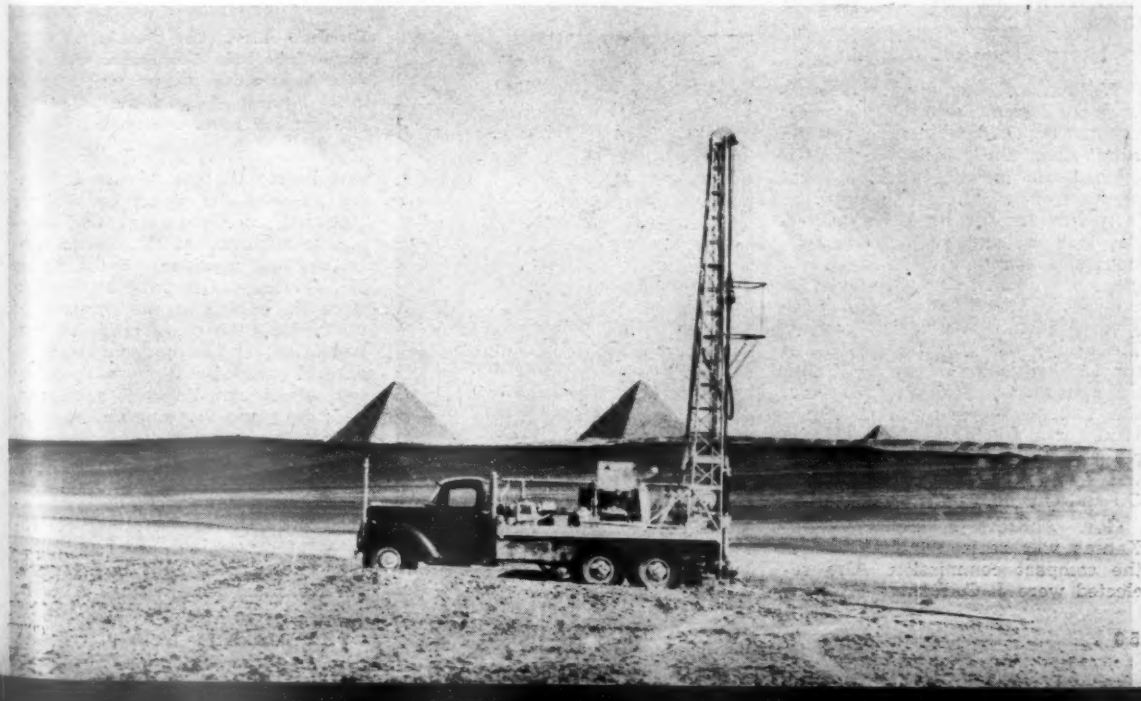
INTERNATIONAL—State Department analyzing Anglo-American oil pact changes suggested by Petroleum Industry War Council. . . . Basis sought for reopening negotiations with British. . . . Intent of original version and revisions believed not irreconcilably separated. . . . Consultations may be sought with PIWC members to clarify specific points. . . . Original treaty likely to remain in Senate foreign relations committee with changes to be made by amendment. . . .

PRICES—Office of Price Administration appointing oil advisory committees to deal with questions of subsidies for high-cost production. . . . Most of the highly controversial questions to be dumped in industry's lap. . . .

NATURAL GAS—Oklahoma order, first of its kind, requiring gas pipe-line company to connect shut-in wells marks departure in regulatory practices. . . . Investigation ordered by the Federal Power Commission into rates charged eastern companies by Tennessee Gas & Transmission Co. . . . ¶Railroad Commission hearing evidence on gas conservation with view to forcing cycling and repressuring in certain Texas fields. . . . ¶Compact Commission hears report that regulatory officials hope to soon eliminate all gas waste, promote sound commercial and industrial utilization. . . .

Legendary axioms are defied in this meeting of the east and west. American oil companies are resuming their exploratory work in Egypt after a 4-year interruption. Ancient pyramids of the Near East are in sharp contrast with the modern American exploratory rig

Photo, courtesy George E. Failing Supply Co.



Potentialities of Southeastern States Appraised at Compact Meeting

by Neil Williams

JACKSON, Miss.—Oil and gas development and production potentialities of the southeastern states of Mississippi, Alabama, Florida and Georgia were extolled before the Interstate Oil Compact Commission at its winter quarterly meeting here December 14-16. The meeting was the first held east of the Mississippi, and the record attendance was interpreted as a reflection of the interest and importance attached to the exploration and development activity now going on in this part of the country.

Two of the geological papers presented at the meeting of the Interstate Oil Compact Commission at its Jackson, Miss., meeting last week are presented in substantial text on pages 62-64 of this issue. A third paper, discussing the geological features of Alabama, will appear in a subsequent issue.

"Beating the drum" for Mississippi, Roy T. Hazzard, division geologist for Gulf Refining Co., Shreveport, La., one of the most active operators and producers in this state, told the commission that there is a minimum of 500,000,000 bbl. of oil in sight in fields already discovered in the state. He cited Tinsley, Mississippi's first oil field, opened in 1939, as having produced more than 70,000,000 bbl. so far, and predicted that total recovery would be well over 100,000,000 bbl. The other fields discovered since then surely ought to account for enough additional oil to make the 500,000,000 bbl. he figured.

Venturing a long estimate, Hazzard expressed the opinion that during the next 25 years the state easily could be expected to produce 2,000,000,000 bbl. of oil, probably more.

Morse Reviews Development

William C. Morse, director, Mississippi Geological Survey, Oxford, recounted the field development in the state since the Tinsley field was opened. He indicated that a great amount of additional development is in line for the state. Reports on development and geological conditions in Alabama, Florida and Georgia were presented respectively by Stewart L. Lloyd, acting state geologist, Alabama Geological Survey, Tuscaloosa; Herman Gunter, director, Florida geological survey, Tallahasse, and Garland S. Peyton, director, Georgia Department of Mines, Mining and Geology, Atlanta. These reports are published elsewhere in this and succeeding issues of The Oil and Gas Journal.

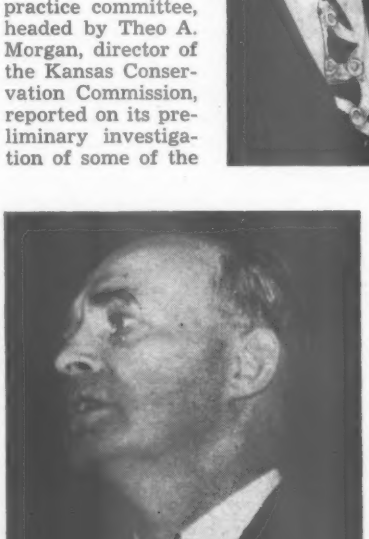
Gov. Andrew F. Schoeppel of Kansas was reelected chairman of the compact commission. Also reelected were J. C. Hunter, Abilene, representative for Texas, first vice chairman, and all members of the executive committee, composed of representatives from Kansas, Oklahoma, Texas, New Mexico and Louisiana. Warwick M. Downing, Denver, was elected second vice chairman, filling the vacancy created by the resignation earlier this year of Clarence Smith, representative from Illinois.

The regulatory practice committee, headed by Theo A. Morgan, director of the Kansas Conservation Commission, reported on its preliminary investigation of some of the factors which may enter into the future over-all picture of the production, transmission and sale of natural gas.

"With a rapidly expanding market, better prospective prices and greater availability of equipment and materials," the report stated, "most of the gas now not being utilized for economic reasons may be collected and saved. The gas-producing states are now looking forward, under a more advantageous marketing and price condition, to the complete conservation of this natural resource."

Gas came up for further discussion before the commission in connection with the report by Wallace Hawkins, vice president and chief counsel, Magnolia Petroleum Co., Dallas, and president of the Texas Mid-Continent Oil and Gas Association. He explained the position of that association concerning the control of movement and marketing of natural gas. Resolutions adopted by that association, Hawkins explained, took the stand that production, storage, gathering and conservation of gas is exclusively a matter of state concern. Hawkins said that the Federal Power Commission is empowered to grant or withhold certificates of convenience and necessity for construction and operation of gas lines and installations. Also, he

Lawrence Alley, chief clerk of the Oklahoma Corporation Commission, and Warwick M. Downing, second vice chairman of the Interstate Oil Compact Commission, photographed between sessions



Roy T. Hazzard, one of the speakers at the compact meeting

said, the transportation of oil may be regulated by the Interstate Commerce Commission, and in the same manner the transportation of gas also may be. The association contends, he continued, that once the gas enters interstate commerce, however, it is in a free competitive market.

Sam H. Jones, former governor and representative for Louisiana at the compact meeting, immediately arose for a "point of information," stating that if the position reported by Hawkins was to be the policy of the Compact Commission, Louisiana would be forced to give 60 days' notice of withdrawal from the compact. He pointed out that Louisiana was under a legislative mandate diametrically opposed to the position expressed by Wallace, and thus could not adhere to it.

J. C. Hunter, Abilene, Tex., presiding chairman of the session, and Governor Schoeppel of Kansas, chairman of the commission, assured Jones that the statements of Hawkins constituted only a report of the position of the Texas association, and not the policy of the compact. They also assured him that the compact has no power of compulsion, and that nothing brought before the compact is binding upon the individual members.

The Research and Coordinating Committee presented a detailed report on measurement of bottom-hole pressures and application of the data to conservation and proration problems. It also announced that John M. Kelly, state geologist and director of the New Mexico Oil Conservation Commission has been elected chairman of the committee, succeeding L. B. Taylor, petroleum engineer, Kansas Conservation Commission, and L. L. Jordon, Arkansas Oil and Gas Commission, vice chairman.

William R. Boyd, jr., chairman of the Petroleum Industry War Council, and president of the American Petroleum Institute, praised the work being done by the petroleum industry in supplying greatly increased military and domestic requirements for oil. He predicted that petroleum has a far greater part to play in the world of tomorrow, and that the industry after the war will face greatly increased responsibilities arising from the urgent need for greater discoveries of new oil, and for repressuring and careful management of many war-depleted fields. He expressed the opinion that in this the compact commission will have tremendous new opportunities as well as responsibilities.

Dr. John J. Grebe, director of physical research, Dow Chemical Co., Midland, Mich., discussed the economic and industrial future of the South in his address on "The South Looks to the Future."

Mississippi Operators Organize Engineering Committee

JACKSON, Miss.—Organization of the Mississippi Oil and Gas Engineering Committee to obtain and arrange factual reservoir engineering data on the various oil and gas fields of this state was undertaken at meeting here December 14 at which approximately 60 Mississippi oil operators were represented. D. V. Carter, chief engineer, Magnolia Petroleum Co., Dallas, Tex., is temporary chairman, and F. A. Heath, Sun Oil Co., Dallas, temporary secretary. A second open meeting has been called to be held at Jackson January 12 to complete final working plans.

The temporary nominating committee appointed at the organization meeting has recommended the selection of Alec M. Crowell, consulting engineer, Shreveport, La., as permanent full-time director of the general committee. Mr. Crowell, until recently, was director of production, Arkansas Oil and Gas Commission, Eldorado. His election will rest with the executive committee, composed of representatives to be appointed by seven member operators. Members on the executive committee tentatively include representatives of five major companies and two independents. These, selection of which was based largely on amount of production owned by each in the state, are Union Producing Co., California Co., Gulf Refining Co., Carter Oil Co., Sun Oil Co., H. L. Hunt and Frank and George Frankel.

Articles of organization provide that the supervisor of the Mississippi Oil and Gas Board be an ex-officio member of the general committee. H. M. Morse is the present supervisor. The collection of complete fundamental reservoir engineering data will be available to the committee members and the supervisor of the state oil and gas board to the end that good operating practices may be attained.

Factual data to be obtained by pools have been defined as: Developed area, name of producing formation, number of wells, average porosity, permeability range, average depth, original gas-oil contact, original oil-water contact, gravity of oil, gravity of gas, bottom-hole temperature, average gas-oil ratio, average bottom-hole pressures, current and cumulative production history of oil, water and gas, and all gas-oil ratio and pressure tests made under the supervision of the director.

Echols Sells His Holdings In Common Dome Pool

HOUSTON. — George H. Echols, independent oil operator of this city, has sold his holdings in the Common Dome pool of St. James Parish, Louisiana, to R. Thomas McDermott, Houston and New Orleans oil man. The consideration was reported to be about $1,000,000. The transaction involves some 2,435 acres, with four producing wells.

Alex M. Crowell, consulting engineer, Shreveport, newly appointed director, Mississippi Oil and Gas Engineering Committee; John M. Kelly, state geologist and director New Mexico Oil Conservation Commission; H. M. Morse, Director Mississippi Oil and Gas Board, and T. A. Morgan, director, Kansas Conservation Commission

Jersey Affiliates Combine Pipe Line Operations Under Finney

TWO of the country's important crude-oil pipe-line systems, one operated by Standard Oil Co. of Louisiana and the other by Oklahoma Pipe Line Co., are to be consolidated December 31, it was announced last week by Standard Oil Co. (New Jersey). The consolidated system, with a northern division operating from Tulsa, and a southern division, operating from Shreveport, will be named Interstate Oil Pipe Line Co. Headquarters will be in Tulsa.

The consolidation, which will precede the year-end merger of Standard Oil Co. of Louisiana and Standard Oil Co. of New Jersey, already announced, is part of a simplification program. It is expected to provide a better crude-oil service for the Baton Rouge refinery.

W. R. Finney, who has been in charge of all pipe-line operations of Standard Oil Co. of New Jersey, will be president of Interstate. L. F. Kahle will be executive vice president. Bruce Ramsey will be vice president and manager in charge of the northern division at Tulsa, and Smith W. Day will be vice president and manager in charge of the southern division at Shreveport. Paul Griffin, president of the Oklahoma company, will retire from active duty after more than 35 years' service but will be retained in a consulting capacity.

W. R. FINNEY

Trunk, Gathering Lines Combined

Trunk lines and gathering systems in Mississippi, now operated by the Oklahoma company will be combined with those now operated by the Louisiana company in Louisiana and Arkansas and will be managed from the Shreveport office. The Louisiana company's present pipeline organization will be largely kept intact at Shreveport, but the consolidation, with its increased responsibilities for Mississippi lines, is expected to increase activities in that territory.

The northern division will operate the Oklahoma Pipe Line Co. system in Montana, Wyoming, Illinois, Kentucky and Oklahoma, and the company's organization in Tulsa will be virtually unchanged, although expanded activity in this division also is forecast.

More than 3,500 miles of trunk and gathering lines will be brought together through the consolidation. This includes 583 miles of gathering and 1,588 miles of trunk lines now operated by the Louisiana company and 444 miles of gathering and 1,039 miles of trunk lines owned by the Oklahoma company. The Oklahoma company was organized in 1909, shortly after the opening of the great Oklahoma pools. The Louisiana company's pipe-line department also was organized in 1909 to move crude oil from Oklahoma to Baton Rouge.

Finney, Stanford University graduate in mechanical engineering, started in the oil business as a roustabout in 1914. He rose to higher posts, and he was handling engineering work of Pan American Petroleum & Transport Co. in 1932, when that company's foreign properties were acquired by Standard Oil Co. (New Jersey). He continued with Standard and in 1936 was elected president of Oklahoma Pipe Line Co.

Griffin joined the company as a clerk. He was made chief clerk in 1918 and 3 years later was elected secretary and director. In 1923 he was made assistant treasurer and in 1926 was advanced to treasurer. He was chosen vice president in 1930, continuing to perform the duties of treasurer. He was made president in July 1941.

Kahle, an engineering graduate of Iowa State College, has served Standard Oil Co. (New Jersey) subsidiaries since 1924, starting as a laborer. He was employed as engineer, assistant chief engineer, then chief engineer for Cia. Transcontinental Petroleo. From 1935 to 1941 he was chief engineer for Standard Oil Co. of Venezuela, in the latter year becoming operating superintendent of the company's Caripito terminal. In 1943 he was loaned to the U. S. Navy to do consulting work.

PAUL GRIFFIN

L. F. KAHLE

Postponed A.P.I. Meeting Set for November 1945

NEW YORK.—The deferred twenty-fifth annual meeting of American Petroleum Institute will be held in November 1945 in Chicago, directors of the Institute have decided. The precise date will be determined by the executive committee. Hotel accommodations are a factor. The meeting scheduled originally for Chicago in November this year was postponed because of war uncertainties and transportation difficulties.

FOUNDED IN 1910

BY PATRICK C. BOYLE

the OIL AND GAS JOURNAL

Peace and Good Will

ONE-THIRD of the world's population is again about to celebrate the birth of Him who founded a lasting faith for humanity everywhere on the cardinal objectives of peace on earth and good will toward men. Despite steady progress through the centuries in the achievement of those ends, adherents of the Christian religion for many long months have been participating in the most widespread and the most intense war of all times.

It has been asked if the observance of another anniversary under existing conditions in world affairs is not in fact a mockery. We agree with those who insist that it is not.

From within the oil business of this country there are approximately 100,000 men and women in the armed forces. Tens of thousands of the industry's families have one or more of its members fighting in foreign areas. This younger generation is doing its part in conquering powerful enemies, ruthless in their methods and bent on world dominion.

This situation is not new in world history and always it has been necessary to crush a misguided foe before the march of progress under the banner of peace could be resumed. Again we salute those from our industry who with every conceivable weapon, and supported with petroleum's products, are establishing the only sound base for what should be a prolonged peace.

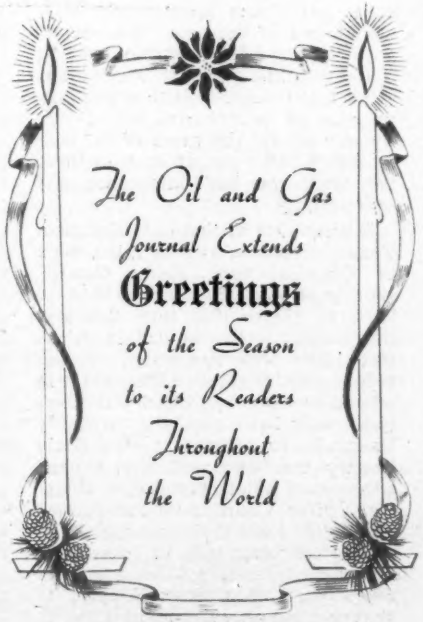
Nor has good will gone into a temporary eclipse. It is not being expressed in the jovial "Merry Christmas," but it is apparent in the considered processes of the oil business at war. It was first expressed by our industry when it placed its entire facilities at the disposal of the military.

Good will was the controlling motive in the decision of every company to make its "know how" available to others. This pooling of technical knowledge and skills in petroleum averted early disaster for the United Nations.

The executive and the technician who dropped their regular duties and went to Washington or elsewhere were motivated by good will in the midst of a national and world crisis. The same desire to help accounts for the action of workmen who have performed every war task assigned them, no matter how arduous. The test has been the common good.

And so it has been in every war activity. Deeds have taken the place of what too often was sophistry expressed in words. Self-interest has been forgotten in the interest of patriotic cooperation. There is no better definition of good will.

Faith has been rekindled by great sacrifices. The true spirit of Christmas is among us. There is hope of better things to come.



Prospecting in Georgia Active; 9,000,000 Acres Leased

*by Garland Peyton**

THE entire width of the belt of crystalline rocks of the older Appalachains is found in Georgia. These rocks occur north of the Fall Line where they consist of granites and highly metamorphosed ancient sedimentary formations. In the northwestern part of the state the entire width of the folded Appalachian is exposed in the northwestern counties, and outliers of the Cumberland plateau occur in Dade and Walker counties. A few test wells have been drilled in the Paleozoic area near Rome in Floyd County, but there is little to encourage hope for the discovery of oil in this section.

The coastal plain of Georgia composes nearly one-half the area of the state. The rocks underlying this surface range from Cretaceous to the present. Interest in prospecting for oil and gas in our coastal plain reached an unprecedented peak during the year 1944.

The total acreage leased by persons interested in prospecting for oil and gas in the coastal plain of Georgia, as of October 1, 1944, was upwards of 9,000,000 acres. This acreage is held in the main by approximately a dozen major oil companies, with smaller holdings by some of the larger independent producers and certain syndicates or groups of individuals. Two years ago the average annual rental paid for leases amounted to from 5 to 15 cents per acre. During the present year, these figures have doubled and in some instances have reached as much as 50 cents per acre. In addition to leasing, there has been considerable dealing in royalties—in most cases by outright purchase of one-half the owner's royalty interest. Information available indicates that the price paid for such royalty interest ranged from 50 cents to as much as $2 per acre, depending on the location of the acreage and the opinion held by the purchaser regarding the potentialities of such acreage.

A number of companies, including the California Co., Humble Oil & Refining Co., Sun Oil Co. and Hunt Oil & Gas Co., have kept geophysical crews busy throughout the year.

Although spasmodic, ineffectual efforts to prospect for oil and gas in the coastal plain of Georgia have been made during the past 30 or 35 years, it was not until 1938 that the first adequate test was made with a rotary rig. During that year the Pan American Production Co. drilled a wildcat well near Offerman in Pierce County. This test was a dry hole and reached granite at 4,375 ft. A few months later a second hole was drilled about 2 miles from the first drillsite. This second well also was dry and reached granite at 4,355 ft.

In 1938 and 1939 shallow tests were made west of the Okefenokee Swamp in Clinch County and north of Pierce County in Montgomery County. Showings of gas and oil were obtained from wells in both these localities. Two horizons yielded showings in Clinch County, one at approximately 400 ft., and the other between 900 and 1,000 ft. Showings in Montgomery County were at a depth of approximately 1,000 ft.

First and Second Wells

On December 24, 1941, a deep well was spudded in about 7 miles from Albany, Dougherty County. This well was suspended early in 1942 after reaching 5,012 ft. It did not reach crystalline rock, however. A second well was drilled 17 miles south of Albany immediately after completion of the first. This second well went to 5,300 ft. without reaching crystalline rock. It was understood that neither well showed much promise of commercial oil or gas. The surprising thickness of the sedimentary rocks encountered in these two wells was both interesting and encouraging.

During 1943 William B. Hinton of Texas selected a site 15 miles west of Donaldsonville, Early County, southwest Georgia, and drilled to 7,320 ft. Up to that time this was the deepest well ever drilled in the state. The well suspended drilling before reaching crystalline rock in what has been identified tentatively as very hard quartzite, probably Paleozoic. In addition to the Early County test, one well was started at a point 7 miles northeast of Douglas, Coffee County, but suspended drilling at 1,200 ft. because of difficulties encountered in cavernous limestone formation. Also a test located east of Coffee County, in Wayne County, stopped at 1,900 ft.

During 1944 H. L. Hunt, of Hunt Oil & Gas Co., drilled two wells in Clinch County, one 15 miles southeast of Homerville, and the other 5 miles southeast of Homerville. These wells, while drilled "tight", are reported to have reached depths of 4,250 ft. and 3,400 ft., respectively. The former is supposed to have encountered crystalline basement rock. Following the completion of the two wells in Clinch County, Hunt moved his rig 6 miles south of Bainbridge, Decatur County, and drilled a well to 261 ft., where drilling was suspended on account of a large cavity. From this location Hunt moved to Echols County, south and southwest of Clinch County, where his fourth well during the present year was completed about October 10. It is understood that Hunt will move his rig to Atkinson County, where his fifth well will be spudded in within the next few days.

The deepest well drilled to date was the J. H. Pullen well, 5½ miles east of Pelham, Mitchell County. This well, started May 27, 1944, was completed August 14. Drilling was suspended at 7,487 ft. in what was reportedly identified as Triassic diabase rock. Those who examined the final sample identified it as crystalline rock. This well has furnished much interesting information, which, when considered with the results from the Early County well, appears to suggest the possibility of finding still greater thicknesses of sedimentary formations in southwest Georgia.

According to announced plans of the various individuals and companies additional wells will be drilled within the next few months in a number of counties throughout the coastal plain, including Atkinson, Worth, Lowndes, Crady, Montgomery, Laurens, Wayne, and several of the counties bordering on the Atlantic Ocean.

Summarizing the work thus far performed in an effort to discover commercial gas and oil in the coastal plain, it appears that thinnest section of sedimentary formation overlies what may be a granite ridge extending from Echols County near the Florida line northeastward through Clinch and Pierce counties toward the South Carolina line. Here sediments may not be in excess of 5,000 ft. There is evidence that these sedimentary formations increase in thickness to the south and southeast and to the west and northwest. To the south formations have been encountered at approximately 5,000 ft., which were identified as Pennsylvanian or Mississippian. Going westward from a line drawn through Clinch and Pierce counties, progressive thickening of sediments is found to more than 7,400 ft. in Mitchell County, and more than 5,300 ft. in Dougherty County.

*Director, Department of Mines, Mining and Geology, Atlanta, Georgia. Presented at the winter quarterly meeting, Interstate Oil Compact Commission, Jackson, Miss.

Six Wells Drilling in Florida; Five to Go Below 10,000 Ft.

*by Herman Gunter**

AS a petroleum producing state Florida is surprisingly recent when you consider that the first wildcat in the state was drilled 43 years ago. In 1901 two test wells were drilled in Escambia County, the most western of the Florida panhandle counties. One of these reached 1,620 ft. and the other was carried 100 ft. deeper. Two years later a wildcat was drilled to 2,002 ft. in north central peninsular Florida, and in 1905 someone tried Escambia County again with a 1,435-ft. hole. After that the wildcatters were discouraged and for 12 years they did not disturb Florida. In 1917 they returned, and from that year until 1939 they drilled 73 tests.

Then in 1939 the Peninsular Oil & Refining Co. drilled 1 J. W. Cory in Monroe County, in the southernmost part of the peninsula. Like the others it turned out to be a dry hole. But in another way it was not like any other well that had been drilled in Florida. It was the first well to do a good job of exploration in the third dimension, that is, depth. It was abandoned at 10,006 ft., which was nearly 4,000 ft. deeper than the deepest well previously drilled in Florida. Going back to the records, we find that the deepest of the 73 wells drilled prior to 1939 was abandoned at 6,180 ft.; only five went below 5,000 ft., while the majority were given up at less than 3,000 ft.

In the 3 years following the drilling of the Cory well, only two wildcats were drilled and the deepest of these reached no greater depth than 6,017 ft.

In 1943 there was a boom in wildcatting; eight wells were drilled. Seven of these were abandoned at less than 3,000 ft. But the people drilling the eighth well had a different idea. They were thinking in three dimensions. They did not give up until they had reached a depth of 11,626 ft., and by that time they had a producing well, the first in Florida. That was Humble Oil & Refining Co. 1 Sunniland, in Collier County in the south Peninsula.

We in Florida think a good deal of this 1 Sunniland well because it is our first, and so far, our only oil well. But as producers in other states go, it is really not very remarkable. The initial production on the pump was a little over 100 bbl. a day of black asphaltic base oil of 20° gravity. From the start, salt water was produced with the oil and there was more or less emulsion that required treatment. The well yields some gas, enough to run the pump and treater, but there is hardly enough left for anything else. During the first 6 months the production declined rapidly to about 30 bbl. of oil a day, while the proportion of salt water in the fluid pumped increased to 90 per cent. Since March of this year production has been fairly steady, averaging about 30 bbl. a day. Total production to date is approximately 12,000 bbl.

*Director, Florida Geological Survey, Tallahasse. Presented at winter quarterly meeting of the Interstate Oil Compact Commission, Jackson, Miss.

Discovery May Have Significance

Production at Sunniland answers the important question of whether or not there are petroleum source beds in Florida with a definite "yes". Apparently a number of major petroleum companies believe that the discovery has significance. As a consequence, there has been some fairly intensive prospecting in the state during the last year. At present six wells are being drilled. Of these, five are in the south Peninsula, that is, in the general region of the Sunniland well. One of these is below 10,000 ft., and with one exception, the others are planned to go to comparable depths. The sixth active well is in the Panhandle. In addition, three locations have been made and drilling on at least one of these will commence in the near future. These locations are also in the southern Peninsula.

There have been two completions since the announcement of the discovery at Sunniland. One of these was in Leon County, which is just about where the Panhandle begins. It was abandoned at 6,520 ft. The other was drilled 1 mile west of the discovery well. It reached a depth of 13,512 ft., without obtaining production, a thing which casts a shadow upon the hope of developing much of a pool at Sunniland. Recently the Humble company has moved the rig to a new location 1 mile north of the discovery well and is making preparations to test the same horizon again.

During the Cenozoic, and probably for a long time before that, diastrophism dealt very gently with Florida. The vertical, or even the 45° dips that are common in such geologically restless states as California are unknown in Florida. As a result it is not very easy to work out the geology from the surface. There are some exposures that are of great lateral extent, but the thicknesses exposed are rarely of more than a few feet.

The oldest beds exposed in Florida are of Middle Eocene age. They occur in a small area along the Withlacoochee River in the northwestern part of the Peninsula, and consist of porous limestone, dolomitic limestone, and even true dolomites, frequently contain abundant particles of vegetable debris and sometimes thin layers of lignite. Locally these beds are full of millioliden indicating deposition in shallow warm water.

Overlying the Middle Eocene beds unconformably is the Ocala limestone of Jackson age. This is an extremely pure, very porous creamcolored limestone. In its typical development it is a mass of large foraminifera, bryosoa, and shell fragments. It is exposed, or lies at a shallow depth beneath surficial materials, over an area of about 3,000 square miles on the Ocala uplift in the northern part of the Peninsula. Another much smaller area of Ocala exposures occurs in the Panhandle, west of the Chattahoochee River. Because of its porosity and remarkable permeability, the Ocala limestone is an important aquifer. On the other hand, normally it is not overlain by beds sufficiently impermeable to seal in and retain hydrocarbons.

On the western flank of the Ocala uplift the Ocala limestone is overlain by the Suwannee limestone of Oligocene age, which is generally more or less porous like the Ocala. To the north and northeast of the uplift the Ocala limestone is overlapped by the Hawthorne limestone of Miocene age and the Citronelle formation of Pliocene age, but since these younger formations have no important bearing on the problem of finding oil in Florida, we will leave them and go to what is known of the subsurface stratigraphy.

The Middle Eocene beneath the outcrop has been divided into three formations: The Avon Park limestone at the top, the Tallahassee limestone, and the Lake City limestone at the base. Locally, more or less of the section has been dolomitized. The divisions are based on the faunas rather than on lithology which is fairly uniform throughout the section.

The Lower Eocene is represented by the Oloamar limestone with Helicostegina gyralis, and beneath that we have the Cedar Keys limestone containing Boralis gunteri, which has been placed in the Midway group and is, therefore, of Paleocene age. In the northern part of

the state these Eocene and Paleocene beds, together, make up a thickness of a trifle over 2,000 ft., while to the south the thickness increases by a few hundred feet.

Beneath the Cenozoic section the drill penetrates a dolomite and dolomitic limestone series containing an Upper Cretaceous microfauna. In its lower part the series becomes chalky and contains numerous Inoceramus priama, as well as small foraminifera characteristic of the Selma. Still lower comes shale, which has been referred to the Eutaw, and beneath that, a fine-grained sandstone assigned to the Tuscaloosa formation. This sequence of Upper Cretaceous beds beneath the Cenozoic is found throughout the northern part of the state. In the south, the clastic beds disappear, their place being taken by limestone.

In a well in the northeastern corner of the state the thickness of Upper Cretaceous sediments was 1,855 ft. Beneath these, the drill passed through nearly 200 ft. of black shale before entering diabase. The diabase is probably Triassic from which it is inferred that the shale is equivalent to the Triassic Newark series. The important point is that no Lower Cretaceous beds were encountered.

Another well drilled on the southeastern nose of the Ocala uplift passed through about 1,000 ft. of Upper Cretaceous sediments before entering metamorphic rocks at a depth of 4,100 ft. Again Lower Cretaceous beds were absent.

Now let us go south to the Sunniland wells. After passing through about 5,000 ft. of Eocene limestone and dolomite the bit entered the Upper Cretaceous at 5,700 ft., and then at 8,311 ft. it passed into dolomitic limestone with abundant anhydrite and a Lower Cretaceous fauna. Production, on the other hand, is from a 13-ft. porosity zone in a limestone which has been correlated with the Glen Rose of Texas. The deeper Sunniland No. 2 logged at least 5,000 ft. of Lower Cretaceous limestone and evaporites before it was abandoned. It appears then that the Upper Cretaceous beds overlap a thick wedge of Lower Cretaceous sediments, and that at least locally, there must be an important unconformity between the Lower and Upper Cretaceous strata.

The structure of Florida is simple. At one point in North Central Florida, the basement complex as we have seen was reached at a depth of 4,100 ft. Elsewhere it must be deeper and in the south it must be much deeper. At any rate, no other well has ever reached it. The sedimentary deposits that overlie the basement rocks have suffered very little deformation. The principal structural feature of the state is a gentle doming that brings the Upper Eocene Ocala limestone about 150 ft. above sea level in the northern peninsula. This dome is elongated in a N 30° W direction. Structure contours on the top of the Ocala limestone show the influence of this doming a little more than halfway down the peninsula so that the length of the structure is something like 250 miles. We know that there is an angular unconformity at the base of the Ocala limestone. This must not be lost sight of, because it may very well be that folding in the pre-Ocala formations is much more pronounced. In the meantime, however, we are forced to contour on the Ocala, because we have not enough points on any older bed.

On the northeast flank and northward along the plunging axis of the Ocala uplift, dips are relatively gentle. Northwestward into the Panhandle there is a more pronounced structural depression known as the Appalachicola basin, although it is really not basin shaped. It is more what I should call a rapidly widening syncline plunging to the southwest. To the northwest of this depression there is a small Chipley-Marianna uplift which stands out very nicely on a geological map of the state as a fairly large patch of Ocala limestone, the only large exposure of Ocala other than that on the Ocala uplift. Leaving the Panhandle and going down the peninsula, we find that south of the Ocala uplift structure is monoclinal with a regional dip of about 7 ft. to the mile to the south-southeast. This happens to fit in with what we know of the stratigraphy down there in an interesting way. The 5,000 ft. or more of Lower Cretaceous sediments at Sunniland must wedge out somewhere to the north and updip. That is rather suggestive, knowing as we now do that Lower Cretaceous limestone in Florida is capable of yielding petroleum in commercial quantities.

DEATHS

Archie M. McCorkle, 61, vice president of Stanolind Oil & Gas Co., died unexpectedly December 17 on a train while returning to his home in Houston from a business trip to New Orleans. McCorkle had been in the service of Stanolind since its organization in 1930. He was associated with Dixie Oil Co., of Shreveport, for years until that company was absorbed by Stanolind. Before entering the oil business he was auditor for El Paso & Southwestern Railroad and then for Montezuma Copper Co. of Mexico.

Harley B. Cook, 49, tax commissioner for Amarillo Oil Co., died December 14 in Amarillo, Tex. He was a son of Fred S. Cook, who is in the legal department of Sinclair Prairie Oil Co., Tulsa, and he was landman for the old Producers & Refiners Oil Co. in Tulsa at the time he left that city to join Amarillo.

Edmondson Dale Luman, 47, geologist, died December 9 in Tulsa. Born in Lucas, Kans., Luman attended University of Kansas and University of Oklahoma. In the latter institution he was assistant instructor in paleontology and mineralogy, receiving a degree in geology. His first field work in 1918 and 1919 was for Roxana Petroleum Corp. In 1919 he joined the geological staff of The Atlantic Refining Co., which was then being organized by the late R. B. Whitehead. From 1923 to 1924 he carried on field work in Mexico and South America for Atlantic, returning to the United States in 1924. Luman was a pioneer in the microscopic examination of well cuttings. His work included detail studies of the Wapanucka formation, upon which he was considered an authority. In 1926 he became division geologist for Atlantic in Oklahoma and Kansas, and in 1936 was made chief geologist at Dallas. He resigned in 1942 owing to ill health and returned in 1943 to Tulsa, where he was operating as an individual.

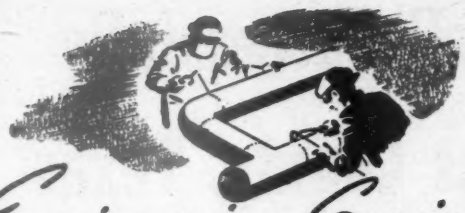
R. M. Lobaugh, of Gillespie & Lobaugh, drilling contractors, Holdenville, Okla., died recently in Wewoka, Okla. He was with Oil Well Supply Co. in Okemah and Wewoka 15 years before joining G. M. Gillespie in the contracting business.

William L. Jarvis, 40, development engineer in the producing department of The Texas Co. at Los Angeles, died December 9.

Claude A. Morrison, 60, a drilling contractor in Oklahoma oil fields, died December 8 in Tulsa.

Louis R. Martin, 60, for 20 years field superintendent for the B. G. Goble interests, Tulsa, until he entered business for himself about 6 years ago, died in Tulsa December 13. While conducting field operations for Goble in 1915, Martin opened the Stone Bluff pool in Oklahoma.

Paul M. Downing, 71, executive vice president of Pacific Gas & Electric Co., died December 14 in San Francisco. He was a member of the first graduating class of Stanford University and was captain of the football team, of which former President Hoover, a classmate, was manager. He served as manager of Colusa Gas & Electric Co., which became a part of the Pacific Gas & Electric system.



Engineering Serial

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Triple Injection Well Successfully Completed in Brooks County, Texas

by E. H. Short Jr.

THE recent triple completion procedure employed by La Gloria Corp. in Brooks County, Texas, indicates that many of the difficulties experienced by operators during early work of this kind have been surmounted. One or two of the first Gulf Coast triple completions failed shortly after the initial work, necessitating considerable time and expenditure to effect a shutoff between the formations.

The method employed in completing the triple-injection well described here demonstrated a safe and comparatively easy means of killing the sands and washing in. This is probably the first test to be completed as a triple-injection well.

Sufficient time has elapsed since the completion of La Gloria Unit 2 to indicate a successful job. While this well is probably the first to be completed as a triple injection well, the most important thing about the job is that the method employed demonstrated a safe and comparatively easy method of killing the sands and washing in.

The La Gloria field, consisting of two blocks termed north and south units, is operated by La Gloria Corp. The field is located 3 miles northwest of Falfurrias, Tex. At present La Gloria Corp. has 23 wells in the two units. Of these wells, 17 are dually completed producing wells, 5 are dual injection wells and 1 well, Unit 2, is a triple injection well.

Gas-distillate production from the field is coming from four different formations as shown in Table 1.

These formations produce approximately 230,000,000 cu. ft. of gas distillate per day which is processed by the La Gloria cycling plant located in the center of the north field.

TABLE 1

Horizon—	Approx. producing depth (ft.)
Brooks sand	5,850
Scott sand	6,050
Jim Wells sand	6,100
La Gloria sand	6,700

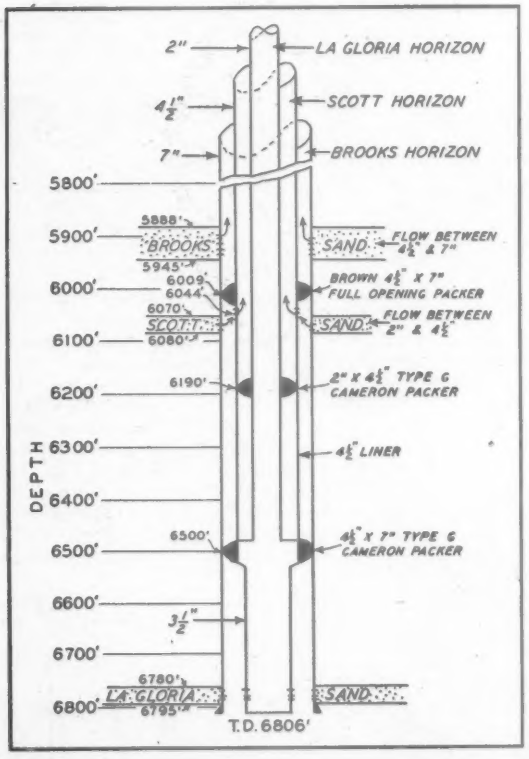


Fig. 1: (Left) Hole diagram showing three-zone completion on injection well

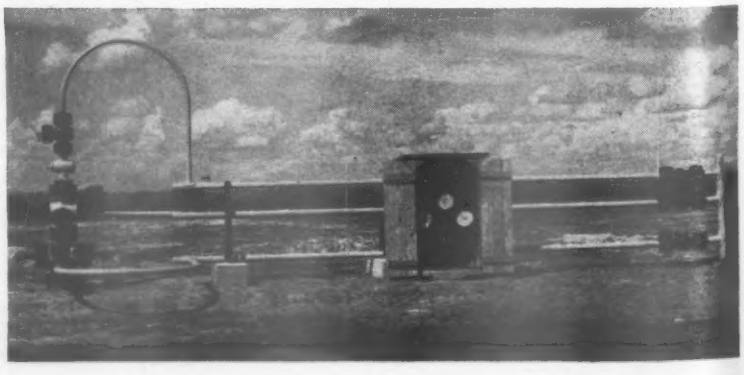
Fig. 2: (Below) View of triple-injection hookup on La Gloria Unit No. 2

In the triple completion of La Gloria Unit 2, a method was used which had not been previously employed in this type of work, and the entire operation was accomplished without any particular difficulty.

The most important advantage of this method of triple completion is that of safety. The three sands were washed separately, and yet the well was under perfect control at all times, despite high pressures.

The strings of pipe used consisted of 7-in. casing, 4½-in., and 2-in. tubing. Before running the 7-in. packer on the 4½-in. tubing, all equipment above the Cameron LDO head was removed and a Cameron preventer with 4½-in. rams installed on the head.

In order of installation, 298 ft. of 3½-in. tubing having a perforated bottom joint was first run into the hole. Then a Cameron Type G anchor packer was screwed on to the 3½-in. This was lowered to bottom on 4½-in. tubing after a 4½-in. by 7-in. Brown full-opening liner packer was installed in the string approximately 491 ft. above the anchor packer. Referring to Fig. 1 it will be noted that when the 3½-in. tubing was bottomed, the upper packer was at 6,009 ft. and the lower packer at 6,500 ft.



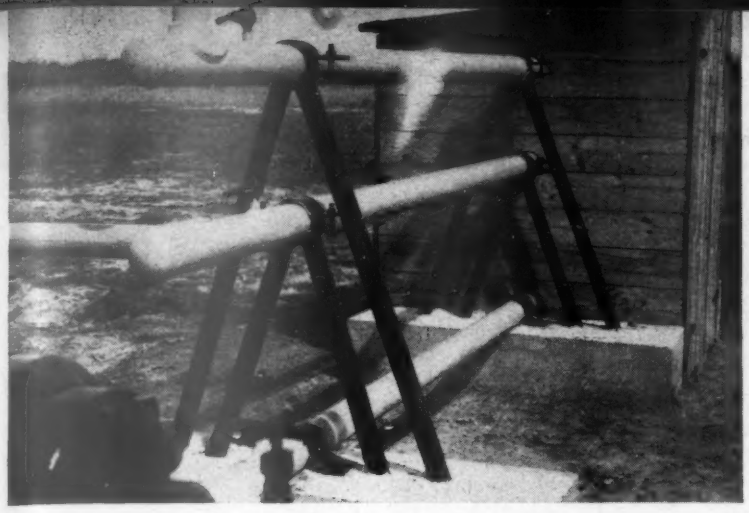


Fig. 3: Closeup view showing method used to support meter runs

When the 4½-in. had been run, a 4½-in. hanger nipple was installed at the top in order to hang the string on the LDO rams after setting the packers. A 4½-in. back-pressure valve was then installed in the hanger nipple. Holding the 4½-in. tubing off bottom, with 4½-in. rams closed around the landing joint, water was pumped down the 4½-in. and out through the perforations at 6,009 ft. in order to wash in the Brooks sand. The flow was controlled by the 4½-in. rams, which were closed.

After bringing in the upper sand through the annular space between the 7-in. casing and 4½-in. tubing, the water in the 4½-in. tubing above the perforations was displaced with mud. The tubing was then lowered, collapsing the two 7-in. packers. After this operation it was hung in the bottom 4½-in. rams.

In order to prevent back flow, the 4½-in. back-pressure valve was left in the hanger nipple while the top preventer (7-in. with 4½-in. rams) was removed and replaced by a 7-in. LD tubing head equipped with 2-in. rams. The 4½-in. back-pressure valve was then removed from the hanger nipple.

The next step involved the running of 2-in. tubing and a 2-in. by 4½-in. Cameron anchor packer. This string was landed on top of and inside of the 7-in. packer, as shown in Fig. 1. The 2-in. by 4½-in. packer was at 6,190 ft.

After the 2-in. tubing had been run, the top part of the christmas tree was made up on the hanger flange, spacing the tubing so that when the 4½-in. packer was collapsed, the hanger flange would land and bolt on top of the tubing head.

The kelly was connected to the top of the christmas tree in order to hold the 2-in. by 4½-in. packer open while washing in the two lower sands. At this time the 2-in. rams were closed and washing-in operations begun. All mud was displaced by pumping down through the 2-in. and back up through the annular space between the 2-in. and 4-in. strings of tubing.

After both sands had started flowing, the tubing was lowered, collapsing the 2-in. by 4½-in. packer, thereby effecting the final stage of triple completion. The setting of this packer directed flow from the La Gloria sand up through the 2-in. tubing. Production from the Scott sand flowed through the annular space between the 2-in. and 4½-in. tubing. The Brooks sand, which was brought in first, flowed through the annular space between the 4½-in. tubing and 7-in. casing.

The final surface hookup shown in Fig. 2 is one of the neatest, most compact triple-completion well hookups in operation. It will be noted that each wing is equipped with check valves (which operate by a pressure differential) to prevent flow back from the formations. The injection gas is going into the well at a temperature of approximately 220° F., and excessive strain upon the christmas tree is prevented by the expansion loops, or whiskers.

In making this particular triple completion, the well-head connections went through three distinct stages before the final tree emerged in the fourth stage. Fig. 4 shows the four stages. Diagram A shows the well-head connections after all equipment had been removed above the Cameron LDO head in preparation to the running of 4½-in. tubing. A preventer was installed with 4½-in. rams. B shows the equipment prior to the running of 2-in. tubing. The top preventer was removed and replaced by a 7-in. LD tubing head, equipped with 2-in. rams. Stage C shows top part of tree made up on hanger flange. Final hookup is labeled D.

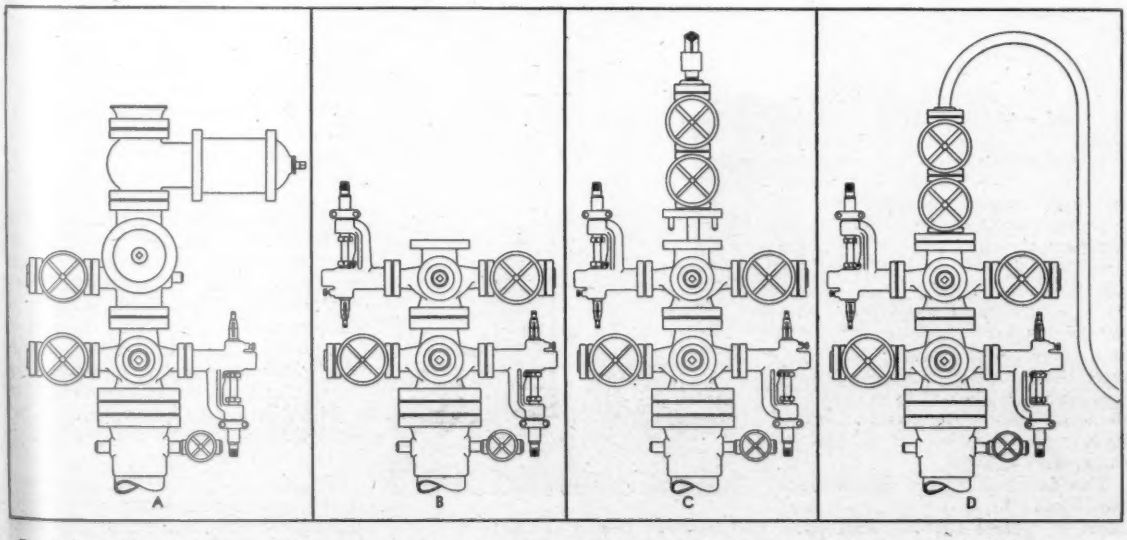
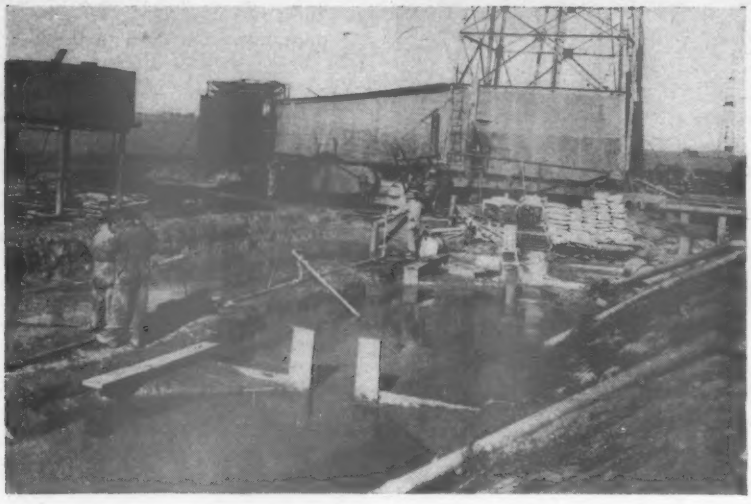
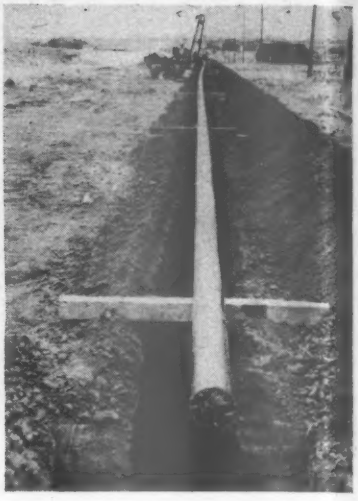


Fig. 4: In making the triple completion, the well-head connections went through three distinct stages before the final tree emerged





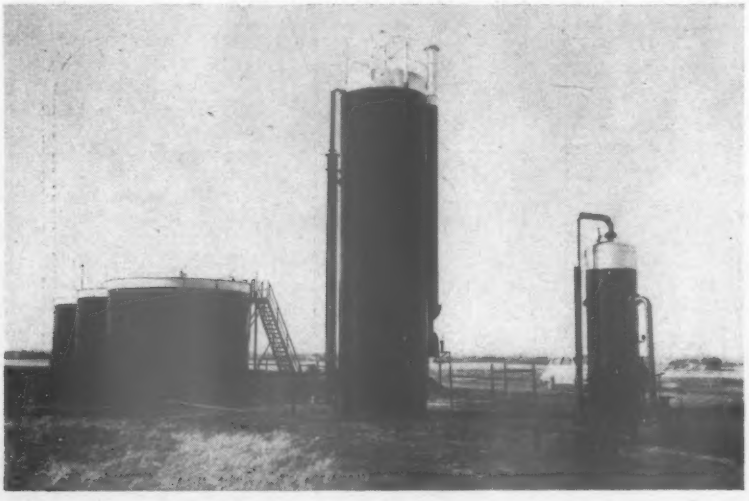
Left: Mud control is carefully exercised after about 5,000 ft. depth. In this view the crew is jetting pits. Right: Trunk pipe line under construction by Oklahoma Natural Gas Co. for transporting residue gas from gasoline plant

Status Report on West Edmond

by Kenneth B. Barnes

This big Hunton pool is being developed rapidly, but under careful control. At present the gas-oil ratio is 1,000; bottom-hole pressure is 2,784 p.s.i. There are approximately 500 total drilling and producing operations, and two gasoline plants. Cumulative oil produced is over 7,000,000 bbl. The field has dissolved gas drive possibly combined with some water from downdip. The exact limits of the reservoir are still undefined.

LARGE sized wells in the Hunton lime are being completed at West Edmond in Oklahoma, at the rate of approximately two per day, but the operators prefer to restrict total productivity from the large pool and to study further trends in reservoir pressure, gas-oil ratios, water encroachment, and other factors to determine optimum withdrawal rates conducive to maximum recovery. This was forcibly brought forth at the hearing of an operator's petition to reduce the allowable per well, held before the Oklahoma Corporation Commission on November 27. Current allowable had been 200 bbl. per day per well, with one cut already having been made. Previous to May 1944, the permissible rate was 300. This status report will include details presented at the meeting which led to the fixing of the new restricted rate of 150 bbl. per well per day; together with current wells, active locations, accumulated production, and recent pictorial illustrations of field activity.

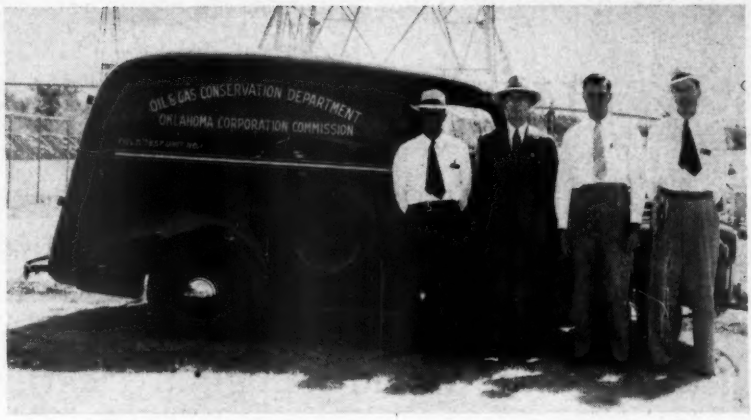


Three 1,000-bbl. stock tanks, dual separator treater, and test separator with manifold to individual wells on 160-acre lease

One estimate of the possible eventual size of the pool, based upon scrutiny of all geological and structural control to date, was presented as 30,000 acres, with 800 million barrels of oil in place, and approximately 200 million barrels recoverable on the basis that principal reservoir force proves to be due to expansion of dissolved gas. As to size, further drilling in the next few months should extend northwestwardly sufficiently to show the proven limits in that direction, as will extensions to the south along the west edge of the Bluff Creek water-reservoir area and lake. Present west-side locations, of course, are in near proximity to the downdip water edge of the big wedge-like trap, while to the east several rows of locations may be proven up before the edge of the updip pinchout is precisely defined.

Some wells in the present proven area have found saturation in the Haragan-Henry house and the Chimney Hill, the middle and lower

members of the Hunton lime, and further correlation and future development of these minor productive zones eventually will add some oil to the total ultimate recovery. The Pennsylvanian Bartlesville or "Chicken Farm" sand so far has been found to be of very low permeability and only a few feet thick, and likely will be noncommercial at many locations. Assisted by shooting, a few small wells already have been completed in this formation. To the north, one well on the east edge has been productive of gas, and to the northwest the Bartlesville has been reported as thicker and of better character in outpost wells although oil production is still to be determined.



Oklahoma Oil and Gas Conservation Department's field unit used in part of West Edmond tests. Shown are Elmer Capshaw, natural-gas engineer; Walker T. Pound, conservation officer; Tom D. Bailey, petroleum engineer; Dan Howard, geologist

Water Data Reviewed

At the conservation hearing, engineering and geological representatives stated that evidences of water drive were confined to a 3 to 4-mile-long strip centrally along the west edge where 18 wells are producing 1,200 bbl. of water per day. However, some of these are cutting but small percentages, and in two or three the water shows have not been constant. Central portion of the water-producing area is in the west portions of 31-14n-4w and 6-13n-4w. There is only one Hunton well which is being pumped.

Many engineers and geologists engaged in the West Edmond operations are of the opinion that the reservoir is now producing by gas-expansion mechanism, either combined with or having the possibilities of combination with water drive to an as yet undetermined amount from the west edge. Encroachment of water in the limited water area probably has not been at rapid rate to date. The pressure differential has been quite low. Part of the water appearance simply may be because some of the locations were either partially below or very near the original oil-water contact. The facts are, with the size of the reservoir undefined, only small withdrawals to date as compared with eventual total yield, and the difficulty entailed in obtaining truly weighted bottom-hole pressure declines with increase in number of wells, it has so far been impossible to calculate water-influx rate, if at all substantial, into the reservoir. Accordingly, at the hearing before the commission the majority of operators expressed belief that the best course was to have the withdrawal rate reduced for a period sufficient to observe and interpret the type of control. After reviewing the considerable bulk of testimony presented on the above phases, the commission reduced the allowable to 150 bbl. per day with average pool rate for December fixed at 43,500 bbl. and for January 1945, at 47,250 bbl. per day. A small minority of the operators represent-

Medium-weight mechanical rig; 4½-in. drill pipe

Water-supply pumping unit, producing from Garber limestone

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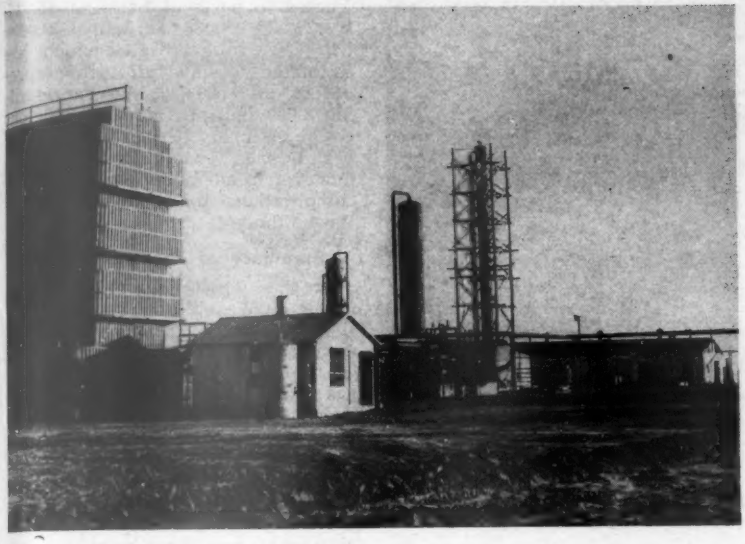
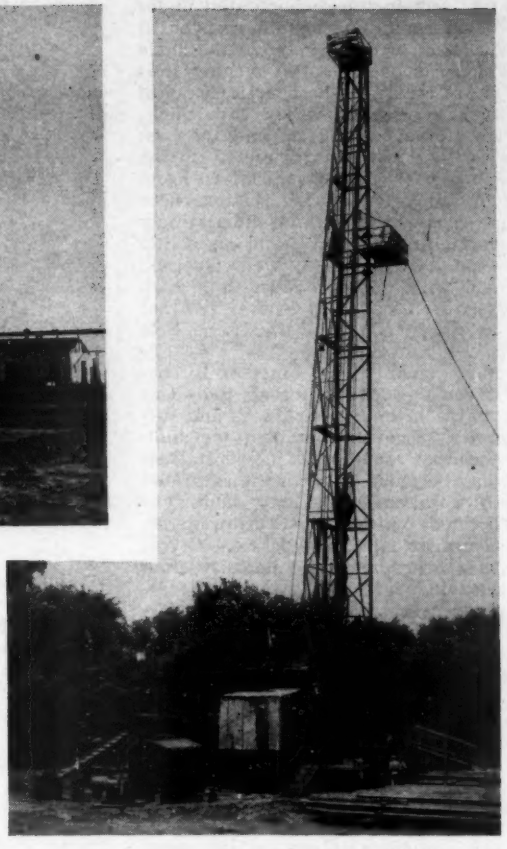




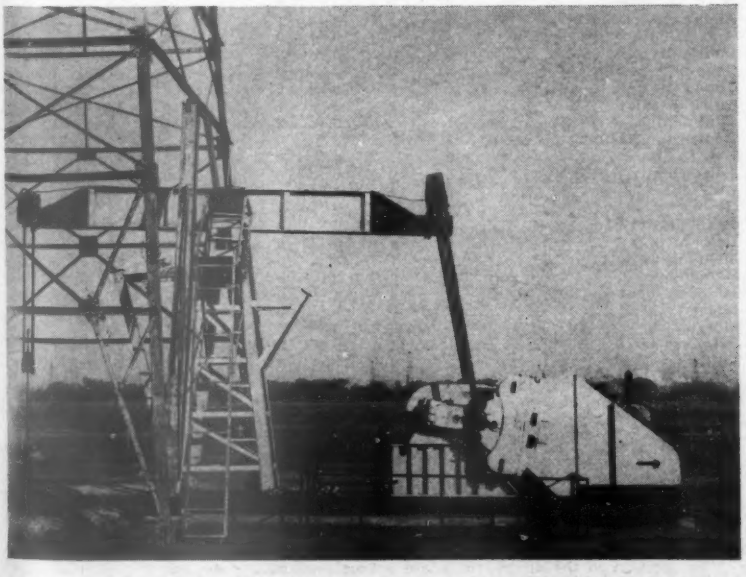
Above: Gasoline plant under construction. The other plant handling West Edmond gas is located in the Edmond pool to the east. Right: One of the jackknife cantilever derricks in use. It has a steel substructure

ed, however, indicated that they felt that the recovery mechanism was virtually exclusively a dissolved gas drive and further restriction in producing rate would not benefit recovery.

Pool Divided

An east-west erosion "valley" exists across the Hunton in the center of the pool, together with an east-west fault shortly southward. The presence of these features may give in the future distinctly different trends in bottom-hole pressures, gas-oil ratios, and well performance to the separate areas so formed. To the south, 16 wells declined 82.69 p.s.i. for the 90-day period ending November 18. In the northern sector, the drop was 57.90 p.s.i. for the same period. These, however, are only point figures and, as mentioned, average pressures which are properly weighted are difficult to compute at this early period. Pressures, ratios, water data, production records, and the like are being observed and reported by the West Edmond Operator's Engineering Association and the Oklahoma Oil and Gas Conservation Department, together with the engineering staffs of the operators.

In the immediate vicinity of the erosional valley fault area, pressures are lower than average. Gas-oil ratios correspondingly are higher, one well recently testing 6,100 cu. ft. per bbl. The November gas-oil ratio tests have not yet been released; however, the majority of the figures are reported to be in the neighborhood of 1,000. The November bottom-hole-pressure survey showed an average of 2,784 p.s.i. for 84 wells. At this pressure level, the reservoir crude, as represented by averages for a number of bottom-hole samples, contains approximately 950 cu. ft. of dissolved gas per barrel and has viscosity of 0.5 centipoises. Reservoir temperature is 146° F. Shrinkage of the reservoir crude from saturation pressure to atmosphere is nearly 50 per cent, on residual or stock-tank basis.



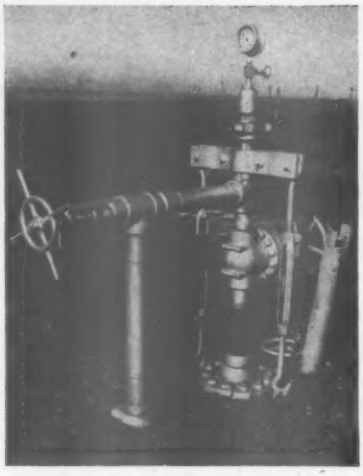
Only one Hunton pumping well is in the field, on the extreme west-central edge

Character of Pay Formation

The phase of the West Edmond Bois d'Arc reservoir which has been least discussed and for which data are relatively meager is the character of the pay itself. Almost all of the wells have been electrically surveyed, and it is generally regarded that for an interval to be

pay section the self-potential under usual conditions should register at least 55 or 60 mv. above the shale line. Isopach maps of the Bois d'Arc credit the best territory south of the erosional valley with thickness of about 100 ft., and the best territory to the north mostly in the range of 50 to 75-ft. thickness. From top to bottom of the section there is coarsely crystalline lime, finely crystalline dolomite, and an oolitic zone which is mostly well cemented and very dense. The coring which has been done in general has not obtained good recovery in the Bois d'Arc. However, some 25 to 30 wells have been cored extensively between the depth intervals placed as "pay" on their electric logs and sufficient recovery obtained for analyses so that some interpretations may be made. Most of the saturated cores taken in the pay section, as defined by the above criterion for electrical data, have permeability of only 1 to 5 md. and porosity from 5 to 10 per cent. A very few scattered test samples will show permeability measurements of 50 to 100 md. or so, and scattered zones of about 5 ft. thickness will have average porosity of 15 per cent, accompanied with a few individual tests as high as 20 per cent. These are low values for both factors. As to permeability, if the total pay section were all of such character the wells would have very low capacity; yet a number of productivity tests on wells through the pool have ranged from 1 to as high as 15 bbl. per 24 hours per lb./p.s.i. pressure drop, with the average possibly running on the order of 3. Fractures and fissures, mostly of small size, have been observed in the cores and this type of permeability undoubtedly contributes substantially to the capacity, plus the amount of better character pay which in part may lie in the core losses. The amount of core data is not large, and the extent to which the values given above are representative of the entire reservoir is uncertain. On the assumption they are average for the pool, the 200-million-barrel recovery estimate for 30,000 acres, or basically 6,666 bbl. per acre, would appear close to maximum expectancy on the basis of prevailing net pay thickness data and the reservoir producing under gas-expansion control for the bulk of the oil-bearing portion.

There are, of course, a number of areas productive from the Hunton in the Mid-Continent which to a certain extent may be reviewed as yardsticks. In Oklahoma these include the small Romulus pool in portions of Sections 31 and 32-8n-4e and 5, 6 and 7-7n-4e, which has produced 1,500,000 bbl. to date from 18 wells; the Jesse pool; Coyle; Keokuk; scattered spots in the Greater Seminole area which have yielded recoveries all the way from 2,000 to 18,000 bbl. per acre, and the Hunton development in the Fox, Milroy, and other pools in the southwestern part of the state. In Kansas there has been considerable Hunton oil at Burrton, and the Graber pool located in parts of Sections 16, 17, 20, 21, 28, 29, 30, 31 and 32-21s-1w has 132 Hunton wells which are estimated to have an ultimate recovery of 9,000,000 bbl. representing 6,000 bbl. per acre. Insufficient detail for many of these pools as to net thickness and quality of the pay, however, renders impossible precise computations for comparison with West Edmond.



Surface equipment; choke setting restricted and well on production

Summary of Present Factors

In the whole, therefore, status report on West Edmond at this time shows large proven and prospective area, probably moderate unit recovery which likely will be by dissolved gas expansion, a current low produced gas-oil ratio with practically all residue utilized as fuel in one form or another, and careful, periodic observations conducted for obtainment of best reservoir control. Studies have been made as to the matter of returning produced gas to the formation, and consideration of the different phases involved therein is now under way. Average total drilling time per well continues in the range of 65-75 days. Installation of production equipment follows standardized lines, deviating only in minor respects as among operators.

WEST EDMOND: BOTTOM-HOLE PRESSURES

	P.s.i.
Initial pressure at 5,864 ft.,	3,110
Pressure at 5,864 ft., March 1944, 15 wells	2,969
Pressure at 5,864 ft., May 1944, 30 wells	2,901
Pressure at 5,864 ft., August 1944, 42 wells	2,800
Pressure at 5,864 ft., November 1944, 84 wells	2,784
Pressure decline, group of 14 wells, March to May, 1944	73
Pressure decline, group of 14 wells, May to August, 1944	87
Pressure decline, group of 31 wells, August to November, 1944	64

OPERATORS — LOCATIONS — WELLS — PRODUCTION

Operators—	Loc.	Der.	Drlg. RUR	WOC test	Oil	Dry	Total	Cum. prod. to Nov. 1, 1944
Allied Oil	1	0	1	0	1	0	3	6,045
Amerada	0	0	0	0	1	1	2	12,566
W. E. Anderson	0	0	1	0	1	0	2	0
Anderson-Prichard	2	5	7	1	16	0	31	172,703
Apex Drilling	1	0	0	0	0	0	1	0
Bourland	0	0	0	0	2	1	3	129,416
Champlin	0	0	1	0	1	0	2	7,401
Chudacoff	0	0	0	0	2	0	2	*30,881
Cities Service	3	1	3	1	5	0	13	33,588
Continental	1	1	3	2	5	0	12	*31,924
Denver P. & R.	1	5	5	0	9	2	22	430,220
Fox & Fox	0	1	4	0	10	2	17	*329,322
Fox-Schmitz	0	0	0	0	6	0	6	*570,078
Gulf Oil	0	4	5	1	9	0	19	66,027
Gutowsky	2	0	0	0	0	1	3	*0
F. C. Hall et al	0	0	0	0	0	1	1	0
Ilco Corp.	0	1	0	0	0	0	1	0
Magnolia	1	1	2	0	12	0	16	323,545
McMahon	0	0	0	0	2	0	0	76,161
Mid-Continent	0	0	2	0	12	0	14	209,450
Midstates	1	0	1	0	0	0	0	0
Morgan	0	0	0	0	0	1	1	0
Peppers	11	13	9	2	30	0	65	577,979
Phillips	4	9	17	8	32	0	70	241,006
Schmitz	0	0	0	0	1	1	2	*0
Sinclair Prairie	0	0	2	1	4	0	7	173,545
Skelly	0	0	0	0	4	0	4	70,432
Sohio	2	2	28	4	56	2	94	*1,238,613
Stanolind	1	4	7	2	17	1	32	515,817
Tide Water	1	0	1	0	0	0	2	0
Wegener	0	0	1	0	11	0	12	201,075
Total	32	47	100	22	249	13	463	5,447,794

October pipe-line runs, 33,840 bbl. per day. December allowable production, 43,500. In addition to the above, there are 5 Bartlesville oil wells and 1 gas well.
*Figure included or combined with partnership interests.

Characteristics of Electric Logs

*by Park J. Jones**

Mechanics of Producing Oil, Condensate, and Natural Gas

PART 8 OF A SERIES

An electric log has an SP curve, and it may have three resistivity curves. One of the objectives of electrical logging is to record the resistivity of the pay in reservoirs. However, the resistivity recorded on electric logs may be influenced by several factors. First, there are the diameter of a well bore and the resistivity of the mud in the well bore. Second, mud filtrate may invade some beds and change the resistivity of the invaded region. Lastly, the thickness and the resistivity of pay and nonpay must also be taken into consideration.

The SP recorded at a given depth is probably the sum of a number of possible sources of potential. The principal sources of potential, however, are said to be filtration and resistivity potentials. The SP curve is also influenced by the resistivity of mud and by invasion of mud filtrate. Apparently, control of mud resistivity and filtration characteristics is just as important to obtain reliable SP curves as it is to obtain reliable resistivity curves.

FROM the viewpoint of electric-log data as a production tool, a well bore is said to have certain characteristics. Fig. 8-1 is an illustrative example. The diameter of a well bore is denoted by D. The resistivity of the mud or drilling fluid in a well bore is denoted by R_m.

The distance from the wall of a well bore to the front of an invading mud filtrate is called the invaded distance or simply invasion. Invasion is denoted by I. Invasion is expressed in terms of well-bore diameters. Shallow invasion is on the order of one diameter or less, that is, I/D is one or less. Deep invasion is on the order of four diameters or more, that is, I/D is four or more. Values of I/D between one and four probably should be called moderate invasions.

The resistivity of media not invaded by a mud filtrate is denoted by R. The resistivity of the region invaded by mud filtrate is designated by R_I.

Resistivity of Mud Filtrate

The resistivity of mud varies, like that of water, with temperature. Fig. 8-2 shows the effect of temperature on the resistivities of mud and water. The mud data are by Sherborne and Newton.† They also found that the resistivity of mud filtrate closely approximates the resistivity of mud. For the purposes of this work, it is assumed that the resistivity of mud filtrate is essentially the same as that of mud.

*Production consultant, Houston.

†The references in this article refer to those in Article 7.

Drilling mud usually forms a cake on the walls of a well bore. The filtrate from the mud cake invades the media on which the cake is formed. Additional water may also permeate through a mud cake.[3] Consequently, the resistivity of an invaded region may be higher, or lower, than it was prior to invasion.

Resistivity of the Invaded Region

The resistivity of an invaded region is commonly defined by:

$$R_I = R_m \frac{R_o}{R_w} \qquad (1)$$

where

R_I = resistivity of an invaded region, ohmmeters
R_m = resistivity of mud filtrate, ohmmeters
R_o = resistivity of media at 100 per cent saturation by interstitial water
R_w = resistivity of interstitial water, ohmmeters

Equation 1 is probably correct for nonpay in which mud filtrate displaces all of the interstitial water. The question now arises whether Equation 1 is correct for nonpay in which all of the interstitial water is not displaced.

On the other hand, does a mud filtrate displace all the hydrocarbons from a pay or does it displace only some of the hydrocarbons? In addition, does a mud filtrate displace some, or all, of the interstitial water in pay? More experimental work is required to answer these questions. In the meantime, we can estimate the resistivity of an invaded region by Equation 1 only for the special case of 100 per cent displacement of hydrocarbons and interstitial water.

The Resistivity Curves

An electric log has a self-potential curve, which is commonly called

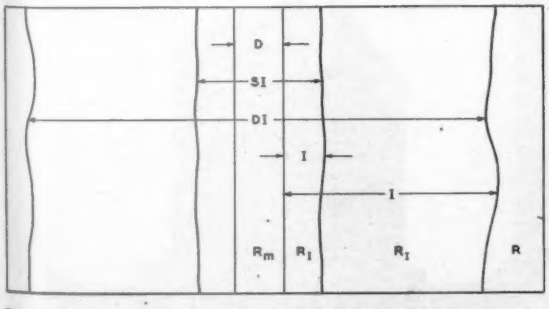


Fig. 8-1: Illustrating a section of a well bore: D, diameter of a well bore; SI, shallow invasion; DI, deep invasion; I, invasion; R_m, resistivity of mud; R_I, resistivity of invaded region; R, resistivity of media

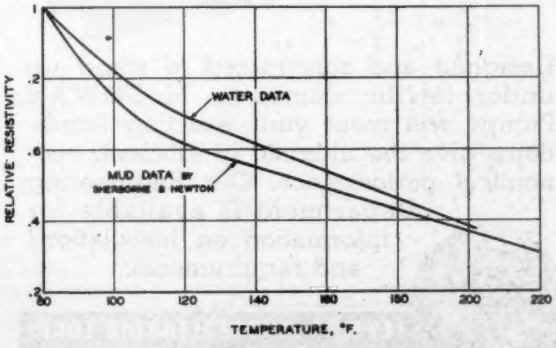


Fig. 8-2: Relative resistivity of water and mud vs. temperature

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the SP curve, and it may have three resistivity curves. The latter are called normal, third, and fourth curves. The spacing of electrodes for a third curve is wider than for a normal curve. The characteristics of a fourth curve are entirely different from those of the normal and third curves. The electrode spacing for a fourth curve is commonly much wider than for a third curve.

The letter S will be used to denote electrode spacing in general. The letters N, T, and F will be used to denote the electrode spacing of the normal, third, and fourth curves respectively. The electrode spacing used in practice is not the same for all production districts. In some districts only the normal and the fourth curves are run. The following are two examples of electrode spacing: N = 20 in., T = 39 in., F = 15 ft.; N = 18 in., F = 16 ft.

The Recorded Resistivity

The resistivity recorded on electric logs is influenced by a number of factors the more important of which are as follows:

$$r = F(D, R_m, I, R_t, R, h, S) \quad (2)$$

where

- r = recorded resistivity
- F = some function of the factors within the parentheses
- D = diameter of well bore
- R_m = resistivity of the mud in a well bore
- I = distance from wall of well bore invaded by mud filtrate
- R_t = resistivity of the invaded region
- R = resistivity of pay or nonpay prior to invasion
- h = thickness of individual beds
- S = electrode spacing which is N, T, F for the normal, third, fourth curves respectively

In practice, the resistivity recorded by a given curve opposite individual beds may equal to, greater than, or less than, the resistivity of the beds.

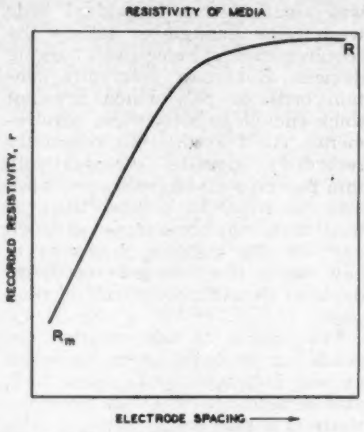


Fig. 8-3: Illustrating recorded resistivity vs. electrode spacing. As electrode spacing is widened, recorded resistivity increases from that of mud to that of media. After Martin, Murray, and Gillingham

Recorded Resistivity vs. Electrode Spacing

Other things equal, the recorded resistivity varies with electrode spacing. The curve in Fig. 8-3 is an illustrative example. Corresponding to exceedingly close spacing, the resistivity recorded is approximately equal to the resistivity of the mud in a well bore. As electrode spacing is made wider, the resistivity recorded increases and approaches the resistivity of media, the objective of electrical logging.

Effect of Mud Resistivity

Other things equal, the resistivity recorded on electric logs may not represent the resistivity of the media logged because the resistivity of mud had not been controlled. Fig. 8-4 is a diagrammatic illustration of recorded resistivity vs. the resistivity of mud. Distances along the horizontal axis represent the resistivity of media which are to be measured. Distances along the vertical axis represent the recorded resistivity. The straight line represents points for which the recorded resistivity and the resistivity of media are equal. The curves represent the recorded resistivity in terms of the resistivity of media for several values of mud resistivity.

The curves in Fig. 8-4 are exaggerated in order to illustrate the

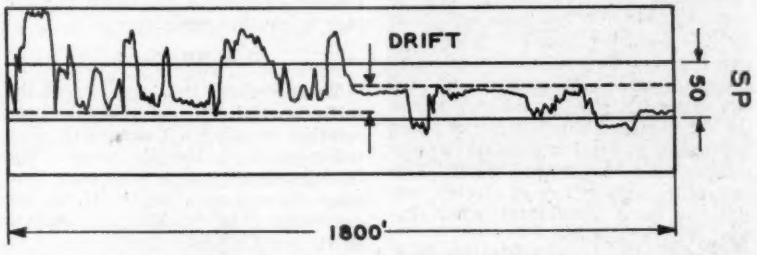


Fig. 8-5: Illustrating SP reversal and drift at fresh-water-salt-water contact. After Houston Geologic Society Study Group

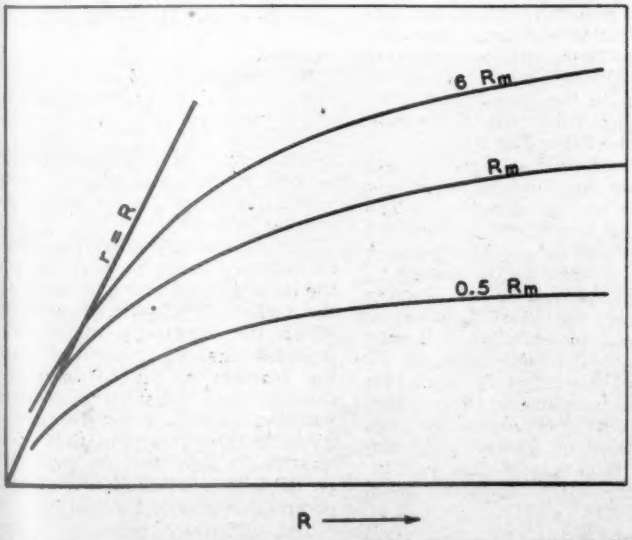


Fig. 8-4: Diagrammatic illustration of recorded resistivity vs. resistivity of media for several resistivities of mud

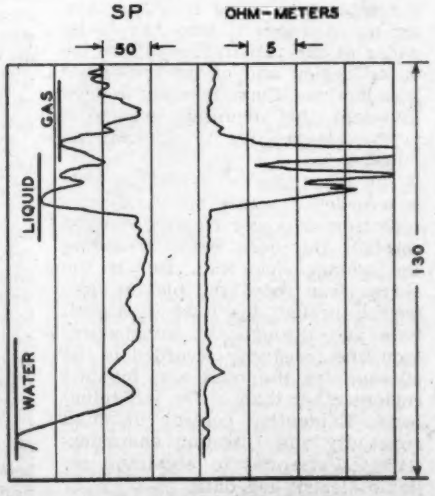


Fig. 8-6: Illustrating SP for reservoir gas, reservoir liquid, and water. After Houston Geologic Study Group

importance of controlling the resistivity of mud in drilling operations. For example, as the resistivity of mud is reduced to low values, which is the case for salty drilling fluids, the resistivity recorded on electric logs approaches the resistivity of mud irrespective of the resistivity of media. Nearly all of the current from a power electrode passes through mud rather than through the beds to be logged.

Required Electrode Spacing

The electrode spacing required in order that the recorded resistivity shall equal the resistivity of the beds logged may be illustrated by the following expression:

$$S/D = F\,(R/R_m,\ I/D,\ R_t/R_m) \qquad (3)$$

S/D = electrode spacing in terms of well-bore diameter
F = some function of the factors within the parentheses
R/R_m = resistivity of individual beds in terms of mud resistivity
I/D = invasion in terms of well bore diameter
R_t/R_m = resistivity of the invaded region in terms of mud resistivity

If there be no invasion, I/D is zero and R_t/R_m becomes equal to R/R_m. So the required electrode spacing depends only on the resistivity of the individual beds and the resistivity of mud. In other words, control of the filtration characteristics of mud is essential to obtaining reliable electric log data. The reliability and utility of electric log data is at a maximum when invasion is negligible.

If there be no invasion, the electrode spacing required to record the resistivity of individual beds is least. Corresponding to shallow invasion, the required spacing is wider than for no invasion. It also has to be wider as the resistivities of the invaded region and of the individual beds increase. Corresponding to deep invasion, the required spacing is very wide relative to that for no invasion.

The resistivity of individual beds is recorded if nearly all of the current from a power electrode passes through the beds before reaching the pickup electrodes. But if the current can reach the pickup electrodes through the mud in a well bore and through the invaded region, the resistivity recorded is the average for the mud and invaded region rather than of the individual beds. Evidently, control of mud resistivity and filtration characteristics is essential to obtaining reliable electric log data.

Thickness of Individual Beds

In connection with Equation 3, it was assumed that individual beds were thick enough to satisfy the requirements of electrical logging devices. But most reservoirs contain beds of pay which are not thick enough to meet these requirements. As a result, the resistivity recorded opposite comparatively thin pay on a given resistivity curve may be equal to, greater than, or less than, the resistivity of such pay. So the question arises as to how much the recorded resistivity deviates from the resistivity of such pay.

The answer to this question depends on at least seven variables as was indicated by Equation 2. It also depends on whether the resistivity of a thin pay is more, or less, than the resistivity of an adjoining bed of nonpay. Most men work out a set of rules for their own purposes on estimating the quality of a pay after studying several hundred thousand feet of resistivity curves and SP curves for a wide variety of reservoir conditions. But it is doubtful if such rules could be applied by men other than the one who formulated them. The rules come from correlation of drilling time, core data, drill-stem tests, and production tests with the characteristics of electric logs. Finally, comparison of sample logs with electric logs is routine practice.

The SP Curve

The SP curve is a measure of the self-potential of individual beds relative to the self-potential of a reference bed, usually shale. The characteristics of a reference bed may change with depth. If so, the reference line or base is said to drift, see Fig. 8-5.

The principal sources of SP are said to be filtration and resistivity potentials.* Still other sources of potential probably exist, for example, diffusion and phase boundary potentials. Then, too, a portion of an SP amplitude may be caused by differences in the quantity of interstitial water. This seems to be indicated by the SP in Fig. 8-6.

The SP recorded at a given depth is probably the sum of a number of possible sources of potential. The SP recorded at a given depth is not necessarily the SP at that depth. A recorded SP may be influenced by the SP above and below a given depth. Here, the question arises as to how thick an individual bed must be in order that the recorded SP shall equal the SP of the bed. This may be a nonsense question from the viewpoint of SP alone. But from the viewpoint of what is pay, nonpay, and thickness of thin pay intervals, the question seems pertinent.

*Resistivity potentials are also called salinity, concentration, electro-chemical, and electro-osmosis, potentials.

Experimental work is required to determine the change in SP amplitude as a function of pay thickness. Experimental work is also needed to determine the conditions for which all of SP amplitude is caused by filtration and resistivity potentials.

Filtration Potential

The filtration potential of media, E_f, is said to be proportional to the resistivity, R_f, of a fluid being displaced through media. Filtration potential is also said to be proportional to the pressure difference, ΔP, causing the displacement, that is:

$$E_f \propto R_f\,\Delta P \qquad (4)$$

Displacement into a well bore is said to be positive and away from a well bore, negative. Other things equal, a positive SP may indicate an impending blowout. By Equation 4, filtration potential approaches zero as differential pressure approaches zero. Filtration potential also approaches zero as the resistivity of mud becomes small. In other words, a salty mud tends to reduce the amplitude of an SP curve.

As filtration potential is attributed to the displacement of a fluid through media, it apparently must be a function of the effective permeability to a fluid. Therefore, the portion of an SP amplitude caused by filtration potential must vanish as the permeability of media, or of a mud cake, approaches zero. Apparently, a recorded SP does not necessarily indicate permeability.

Resistivity Potential

The resistivity potential, E_r, is proportional to the logarithmic difference of mud and interstitial water resistivities, that is:

$$E_r \propto (\log R_m - \log R_w) \qquad (5)$$

where
R_m = resistivity of mud
R_w = resistivity of interstitial water

Equation 5 assumes permeability to ions. A dielectric may be impermeable to fluids yet be highly permeable to ions.

The resistivity potential is said to be negative on an electric log when the resistivity of mud is greater than the resistivity of interstitial water. When the resistivity of mud approaches that of interstitial water, the fraction of an SP amplitude caused by resistivity potential vanishes. Finally, when the resistivity of mud is less than that of interstitial water, the component of an SP kick attributed to resistivity potential is said to be positive.

The resistivity potential is evident primarily opposite beds of very low permeability. For example, the

difference in the SP caused by resistivity potential between a 1,000-md. bed and 10-md. bed is small relative to a corresponding kick between 10 and 0.1-md. beds. In other words, the increase in resistivity potential per unit increase in permeability becomes imperceptible as permeability increases.

Properties of Mud vs. SP Curves

Other things equal, the SP recorded on electric logs depends on the resistivity of mud and on the filtration characteristics of mud. To illustrate this point, let it be assumed that nearly all of SP amplitude is equal to the sum of filtration and resistivity potentials.

Corresponding to no invasion, filtration potential is zero or positive, whereas the resistivity potential decreases, approaches zero, and becomes positive as the resistivity of mud decreases. In this case, the positive SP caused by resistivity potential (salty mud) does not signify an impending blowout.

On the other hand, assume invasion makes the resistivity of mud and of the water in the invaded region identical. Under such conditions, resistivity potential would be zero. Whereas the recorded resistivity could be negative, zero, or positive, depending on the direction of fluid displacement. In this case, a positive SP would indicate a possible blowout.

Evidently, the foregoing considerations show that control of mud resistivity and filtration characteristics is just as important to obtain reliable SP curves as it is to obtain reliable resistivity curves.

Maintenance Time Saver for Cooper Engines

SHOWN in the photograph with a jack for handling Cooper-engine exhaust-valve assemblies is the master mechanic of Cities Service Oil Co.'s Lacy gasoline plant, the inventor of the device.

Made of discarded engine parts and scrapped pipe the jack reduces installation time about 75 per cent over ordinary methods used to install the particular type of exhaust-valve assembly. In addition to being a time saver the jack is rated highly as a safety measure by the workmen.

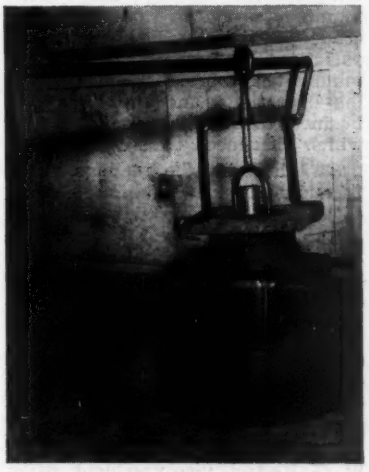
Wheels for the jack are made of discarded cam rollers which run on a ¾-in. axle having cotterpins for retaining the rollers and a 12-in. length of 1-in. pipe through which the ¾-in. shaft is passed for the wheel spacer.

The 1-in. pipe spacer is welded to an 18-in. length of 2-in. pipe at right angles and 11 in. from the end of the 2-in. pipe upon which a discarded valve shoe (Cooper part No. 7, Dwg. G 75-151) is welded. The lower part of the 2-in. pipe is burned off on a taper to give more clearance for the jack, because the working space between an average floor and the boss on the bottom of the Cooper engine cylinder, to which the assembly is attached, often allows as little as ½-in. clearance. Construction details regarding the dimensions from the boss or from the studs to the floor line of a particular installation will determine the height the exhaust valve shoe is to be located above the axle center and if the center of the 2-in. pipe is to be raised adding a spacer of the desired size between the axle and the 2-in. pipe. All such details should be worked out for the particular installation before starting to build the jack.

About 72-in. of 1½-in. standard pipe is required for the handle which is bent to a 20° angle at approximately 8 in. from each end with the bends being opposite in direction. The handle is inserted 2 or 3 in. into the 2-in. pipe and welded in place as illustrated in the photograph.

The exhaust-valve shoe which is located at the end of the jack operates as a holder for the exhaust-valve assembly when the valve stem assembly is inserted into it. The photograph shows an assembly in position for attaching to the engine.

Another idea pertaining to Cooper-engine exhaust valve assemblies developed by the maintenance department of Cities Service's Lacy gasoline plant is a device for compressing the valve spring. Shown in its working position in the photograph, the device makes the removal or installation of the cotter pins a safe and rapid operation. No bolts or other fastening are used for securing the device to the flange of the exhaust valve casting.



C. Kenneth Eilerts, physical chemist at the U. S. Bureau of Mines experimental station in Bartlesville, Okla., recently received an Award of Excellence from Harold L. Ickes, secretary of the interior. This honor, along with an increase in salary, was in recognition of Eilerts' "ingenuity and diligence" in the construction of a portable laboratory, designed to test the characteristics of gas and liquid contents of gas-condensate reservoirs in fields of the Gulf Coast area. Eilerts, a graduate of Oklahoma A. & M. College, majored in chemistry. He joined the staff of the Bartlesville station in 1930.

Design of Stanolind's Elk Basin-Casper, Wyo., Crude-Oil Pipe Line

by Paul Reed

THE design of Stanolind Pipe Line Co.'s 232-mile high-pressure Elk Basin-Casper 12-in. line, completed in the latter part of this year, is distinctly different in some respects. Mountainous terrain, crude oil of widely different characteristics, high-viscosity crudes, low ground temperatures during the winter months, unknown quantities of crude, high hydraulic heads due to variations of elevation in the mountainous terrain, possibility of batching operations, and the growth of business are some of the factors which influenced the design.

At this point the reader's attention is invited to a unique feature of the design, referred to below in discussion of Kirby station which makes use of a hydraulic head of 600 to 700 lb. for suction pressure at the intermediate station and provides for storage space in the line itself for handling the intermittent receipts from field stations pumping into the line between the initial and intermediate stations.

This line is a good example of the modern trend, emphasized by W. G. Heltzel, vice president, Stanolind Pipe Line Co., in his article, "Trend in Pipe-Line Practices," which was published as a series in The Oil and Gas Journal, the first installment of which appeared on page 154 of the September 23, 1944, issue.

This line is one of the longest crude-oil lines constructed in 1944, and along with the 386-mile 16-in. line from West Texas to Drumright, Okla., the looping of the main trunk line with 16-in. pipe between its Drumright and Sycamore stations in Oklahoma and Kansas, relocation of the Casper-Welch 12-in. line, and laying the Craig-Wamsutter 6-in. line, built by Stanolind for the Utah Oil Refining Co. in Colorado and Wyoming, represent the largest pipe-line construction program of any one company for the past 12 months. The total of approximately 813 miles of new line represents a very high percentage of all trunk pipe line built in the United States in 1944 for crude-oil service.

Advances made in the design of Stanolind's Elk Basin-Casper line are of such significance in increasing the efficiency of construction that this article is devoted entirely to discussing these features. Numerous construction operations are reported to have been spectacular when the project was being built where mountainous terrain presented difficulties.

Surveying the Route

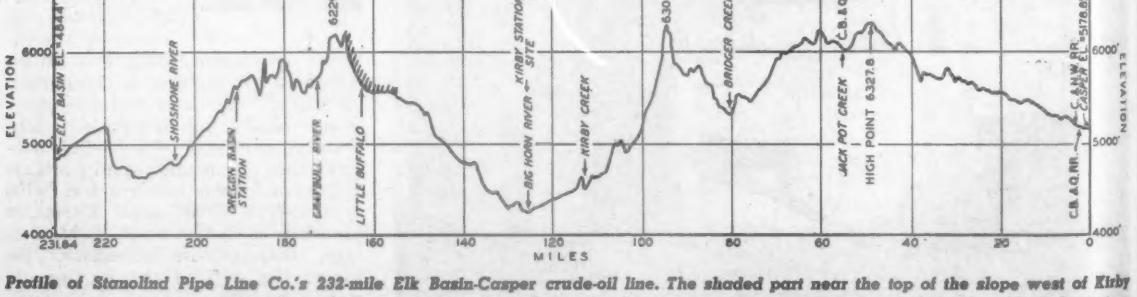
The survey for this line was made according to the usual practice of Stanolind. First, the chief engineer, accompanying a representative of Aero Exploration Co., the aerial photography firm, made two reconnaissance trips by airplane for the purpose of locating the general route of the line. Thereafter, the aerial photographs were made when weather conditions permitted. To avoid deep shadows the best time for taking pictures is during the midday period. Although the reconnaissance was made in the fall of 1943, bad weather and snow delayed the taking of pictures and making the ground survey until the spring of 1944. Ordinarily the aerial photographs are procured several months in advance of the construction.

The second step in the survey is an examination of the aerial photographs in the office of the chief engineer. By careful inspection the exact route of the line is chosen and maps are prepared. From this information the options for right-of-way are procured.

The next and final step is to make the ground surveys and stake the line ahead of the construction crews.

A preliminary study of the general area indicated that three alternative routes might be considered between Lysite and Kirby. From Casper to these points there was not much choice since it was advisable to follow the main highway and the railroad. Analysis showed that a route extending in a northerly direction, across Owl Creek Mountain and up Bridger Creek and Kirby Creek, then turning west into the Big Horn basin at a point north of Thermopolis, was more advantageous because the elevations were approximately 1,000 ft. lower. Consequently pumping pressure could be reduced more than 300 lb. The saving in cost of initial pumping equipment and in future operation is therefore substantial. The middle section of the line is through mountainous terrain.

In planning the route the point was kept in mind that it is sometimes more desirable to spend money for pipe in a longer line than to take a shorter course which would



Profile of Stanolind Pipe Line Co.'s 232-mile Elk Basin-Casper crude-oil line. The shaded part near the top of the slope west of Kirby station represents the section of line which serves in storing oil entering line by intermittent pumpings from Oregon and Buffalo stations

have a very expensive right-of-way. Furthermore, in looking forward to future maintenance, it was desirable to avoid inaccessible and difficult locations where repairs would be impeded. The line runs fairly close to highways except in the section between Lysite and Thermopolis, where it parallels some old trails used for freighting in early days. Well-maintained ranch roads were fairly accessible.

An effort was made to survey a route for contractors to follow which would avoid side-hill construction and areas now being irrigated or later to be improved or inundated by future dams for the benefit of navigation or soil reclamation. By locating the line on ridges and higher points, in addition to avoiding such developments, there were other advantages since higher areas are less conducive to corrosion as they are drier and do not carry the same amount of salts and alkalies that are found in bottom lands.

Important savings in construction were made by using aerial surveys which have demonstrated that they are not expensive. Cost of them ranges from $20 to $40 per mile. Care in reconnaissance and selection of the route enable the pilot to include in the 3-mile-wide area the location where the pipe will be laid. By this method aerial photography costs $22 per running mile. For a line approximately 200 miles long, such an aerial survey would cost about $4,000. With pipe of a 12-in. line costing around $12,000 per mile, only a ⅓-mile shortening of the whole project would save the entire aerial photography cost. Actually, of course, the shortening of such a line is considerably more as the result of aerial surveying.

Another advantage of aerial photography is that it speeds up the surveying crews, because they are relieved of obtaining detailed topographical data on creeks, buildings, and timber. At river crossings, aerial photographs reveal details which would not be seen on the ground, such as erosion, or the old courses of a river that has been changed for several years, perhaps hundreds of years. Comprehensive knowledge of the scope or width of the river and the nature of its changing course makes it possible to choose a crossing point which is fairly stable and less likely to be washed out.

With the guidance of aerial photographic maps it is possible to make deviations from a straight line, so that the deviations will be of considerable length and at small angles. There is not much difference between the length of a straight line and one turning at angles up to 7°. If it is recognized early that it is necessary to deviate to go around an obstacle, a change of direction at a small angle can be made far enough back so that the line is not lengthened. In such planning aerial surveys aid in determining angle points, so as to keep the line as short as possible. In the haste to make surveys for some projects, there has been a temptation to leave intact the route for which a survey has been already completed and to use an unnecessary amount of pipe by turning at sharp angles to avoid obstacles. Usually there are certain points 10 to 15 miles apart which determine the general route of the line. Between these points deviations at small angles are made to secure the best right-of-way rather than the straightest line. Distances between these determining points are not variable to any extent.

Line Design

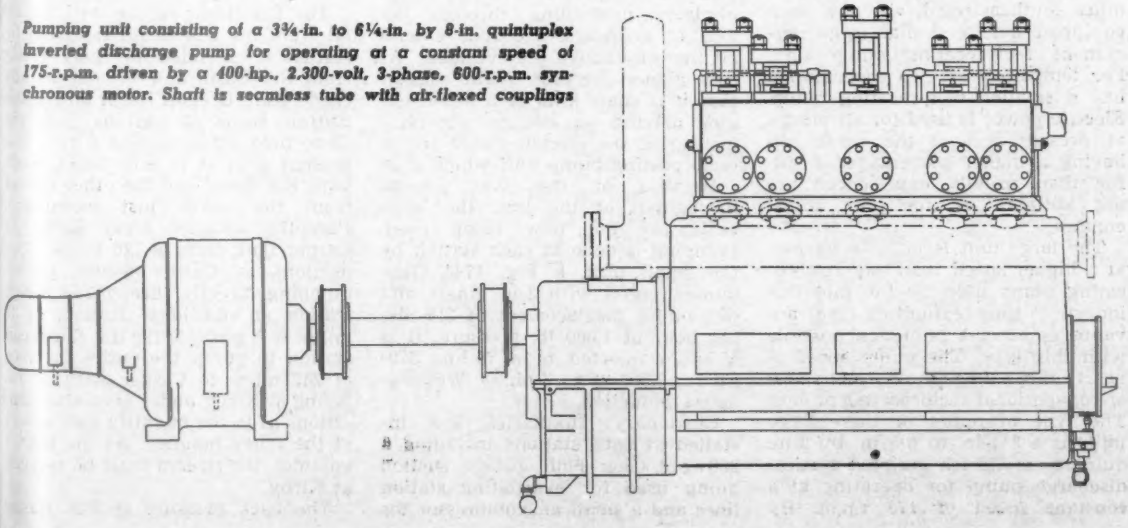
The line was built of National seamless pipe in double random lengths, with joints electrically welded. The line and station piping have been built for 1,400-lb. pressure. Three weights of 12-in. pipe have been used for this 232-mile line. The heaviest is 49.56-lb. pipe laid on the first 33¼ miles of the project; then 7½ miles of 41.51-lb. pipe. The next 11¾ miles is of 49.56-lb. pipe; then 33.6 miles of 41.51-lb. pipe; then 39 miles of 49.56-lb.; then 9 miles of 41.51-lb.; then 97¾ miles of 33.38-lb. This telescope type of design was adopted in order to most effectively and economically provide for pressure conditions at considerable differences in elevation along the route and for the pressure conditions incident to the location of pumping stations.

Three rivers were crossed: Shoshone, Graybull and Big Horn rivers where 65-lb., 12-in. pipe with ½-in. wall thickness was used.

The line was coated and wrapped with a machine application of a compound coating of Perolite asphalt and asbestos felt.

Gate valves used as block valves, also at scraper traps and gates on each side of the major rivers, are all of cast-steel construction with ring-joint flanges. The same type of valves are used at stations and for manifold piping. No cast-iron fittings are used.

Gate valves were located to give protection at rivers and through areas having a large amount of drainage. The policy followed is to place these valves in the lower points in the line in order that provision can be made to drain oil from either side of a valve. This oil can be pumped around the valve through temporary connections in case it is necessary to evacuate the line for repairs or other requirements. When valves are so placed, the line is tapped on each side of the valve and a permanent connection is installed of a special type designed by the company. This type of connection may be opened or closed at any time without maintaining valves perma-



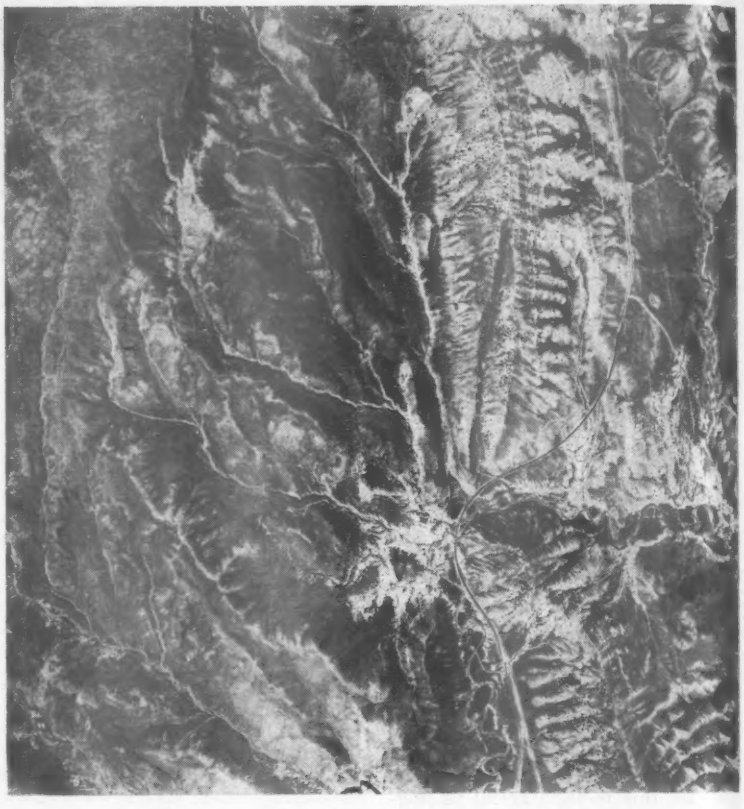
Pumping unit consisting of a 3¾-in. to 6¼-in. by 8-in. quintuplex inverted discharge pump for operating at a constant speed of 175-r.p.m. driven by a 400-hp., 2,300-volt, 3-phase, 600-r.p.m. synchronous motor. Shaft is seamless tube with air-flexed couplings

nently on these side nipples.

Air bleeder valves were installed at the two high points: one near Little Buffalo Basin, and the other near the crest of the Owl Creek Mountain range. These are useful for bleeding air during the process of filling the line. These valves are also useful for giving the line air at high points so as to facilitate draining lines at gates located in low areas. Opening bleeder valves to atmospheric pressure allows the head of oil to flow readily to the low spots.

Laying of the line was contracted by I. C. Little for 147 miles from Elk Basin to Lysite and by Sharman & Allen for 85 miles from Lysite to Casper.

The line is regarded as a high-pressure system. At no point on the line will pressures exceed 1,400 lb. although at times station pressures may be higher. Selection of pipe of various weights was done to provide for points where high heads of liquid could be expected due to the terrain. Furthermore, in the design of the line to meet pressure requirements, consideration had to be given to the hazardous type of crude handled, the widely varying characteristics of crudes that may be handled in quantities which cannot be predicted and with viscosities which at low temperatures may present operating difficulties. The line was designed to have as few pump stations as possible which consequently means long-distance pumping.



Aerial photograph taken during surveying an area 15 miles south of Cody, Wyo., where the line follows the road which crosses over from the valley at the center to the one at the right. (Courtesy Aero Exploration Co.)

Station Design

Although both of the pump stations are designed for 1,400 lb. normal operating pressures, all station equipment is adequate for withstanding pressures as high as 1,800 lb., while line pressures are restricted to 1,400 lb. normal operating pressure. The two pump stations comprising the initial station at Elk Basin and the Kirby station, 105.8 miles southeastward, are now each equipped with a similar large permanent reciprocating pump unit. For temporary service each station has a smaller reciprocating pump. Electric power is used for all pumps at present because the crude oils having a higher percentage of sulfur than usually experienced are not suitable as fuel for diesel engines.

The large unit is built to operate at a higher speed than any reciprocating pump used by the pipe-line industry, thus exploiting the advantages of cost reduction possible with this type. The pump speed is nearly three times the normal speed of conventional reciprocating pumps. The type of pump of these large units is a 3¼-in. to 6¼-in. by 8-in. quintuplex Aldrich inverted vertical discharge pump for operating at a constant speed of 175 r.p.m. By means of a seamless-tube floating shaft equipped with Falk air-flexed couplings, the pump is driven by a 400-hp., 2,300-volt, 3-phase, 600-r.p.m. synchronous Westinghouse motor with direct-connected exciter.

The appearance of such a unit is unusual compared with that of equipment to be observed at standard stations. The pump of such a unit is to operate with porcelain plungers protruding through the tops of cylinders. Tie rods extend all the way above the cylinders. At first glance the unit might suggest that it is some kind of a diesel engine driving an electric generator instead of the electric-motor-driven reciprocating pump unit which it is.

Because of the low present throughput of the line, the large units are not now being used. Pumping is done at each station by the small unit, a Fig. 1745 Gaso duplex pump with 3-in. liners and pistons for displacement of 116 bbl. per hour at 1,000 lb. pressure. It is V-belt connected to a 75-hp., 370-r.p.m., 2,300-volt, 3-phase Westinghouse induction motor.

Customary auxiliaries are installed at both stations including a 200-bbl.-per-hour rotary suction pump used for evacuating station lines and a small air compressor for operating the tank pneumercator for gaging oil in working tanks.

Equipment at each station is housed in a steel frame building with corrugated transite. Motors and pumps are separated by a fire-wall made of wood frame with flat transite on either side. In this partition there are small glass peak windows. A natural-gas-fired boiler in a separate building furnishes steam heating.

The Elk Basin station will handle oil from the Elk Basin field. Kirby station is intended to relay crude from Elk Basin and to later handle crude from Oregon Basin and Little Buffalo Basin as well as from the Gebo field which is near Kirby. The present plan is to mix Gebo crude with Elk Basin and the other crudes from the north just mentioned. Pumping distance from Kirby to Casper tank farm is 126 miles. Connections at Casper would permit pumping directly through to Welch station, an additional distance of 31 miles. It is possible for the Elk Basin station to pump the entire distance of 232 miles to Casper without relaying at Kirby under favorable conditions as to the quantity and nature of the crude handled. At the higher volumes, the stream must be relayed at Kirby.

The back pressure at Elk Basin,

due to high points on the line, will be 500 to 530 lb., depending on whether pumping is all the way through to Casper or only as far as Kirby.

The elevation at Kirby station is approximately 4,260 ft.; elevation at the high point northwestward is 6,229 ft. and the high point southeastward is 6,304 ft. The pressure on the discharge of this station is 745 lb. A unique method of operation is being planned by Stanolind to make use of the 600 to 700-lb. potential hydraulic head on the suction side of the Kirby station.

The plan is to install a pressure-regulator valve on the suction system of Kirby station for operating at 600 to 700 lb. pressure. If this suction head were not utilized, this liquid head from 600 to 700 lb. would be consumed in velocity head which would have no value whatever, since the oil would flow at high velocity into a working tank at Kirby station. By utilizing the 600 to 700 lb. suction pressure, the amount of horsepower required for the pumping equipment at Kirby station is materially reduced; in fact such power requirements will be reduced one-half when Kirby station operates at 1,400 lb. and by a greater percentage at a lesser discharge pressure.

Because two field stations will pump intermittently into the line in between the initial station at Elk Basin and the intermediate station at Kirby and since the pumpings between the two stations cannot be synchronized exactly, the benefit of the hydraulic head as suction head at Kirby station would be neutralized to a large degree by the spillage of substantial quantities through the pressure regulator, the oil flowing to the tank at Kirby station. This would result in a substantial loss of energy and might become an operating nuisance. To take care of this unusual problem it is planned to use a section of the line south of the high point about 40 miles north of Kirby station to absorb the difference between the hourly output of the relay station at Kirby and the pumpings of Elk Basin and the intermediate and irregular rate of pumpings at the two field stations at Oregon and Buffalo stations. The length of the section of the line used for this purpose can be varied to meet the variations in the pumpings. This section of the line running partly full would fill up gradually as it absorbs the excess over the hourly rate of receipts.

At this point attention is directed again to the fact that the pumps at Elk Basin and Kirby stations are driven by electrical induction-type motors and consequently the rate of pumpings remains constant at these stations. This accounts for the method that is being discussed. Assuming that the line fill of the 12-in. pipe is 750 bbl. per mile, 0.67 mile of line would be equivalent to the storage capacity of a 500-bbl. tank. Similarly 2.14, 7.35, and 13.35-mile sections of the line would be equivalent to the capacity of 1,000, 5,500 and 10,000-bbl. tanks respectively. From this it is apparent that by varying the hydraulic head north of Kirby station, storage space can be provided in the line to take care of the variations of pumpings over a 24-hour period and possibly longer. The suction pressure at Kirby station will serve to indicate when the accumulated head should be pumped down.

Laying 12-in. pipe for project in the vicinity of Kirby Creek

It is planned to do this at first by putting on the line a small portable-type pumping unit which was installed at Kirby station for this purpose and for pumping into the line the receipts of crude from the nearby Gebo oil field.

After sufficient experience has been gained in this operation it is the company's intention to install a variable-stroke-type pump, of somewhat less capacity than the large Aldrich constant-stroke pump. Operated in connection with the pressure-regulator valve it will automatically pump down the head that accumulates in the line north of Kirby, due to intermittent pumpings from Oregon and Buffalo basins. Since the stroke of the pump is changed automatically by the suction pressure, a constant head will be maintained on the suction side of the Kirby station regardless of the rate of Oregon and Buffalo Basin pumpings.

The variable-stroke pump will be of advantage in the pumping of a variety of crudes, some of which are highly viscous in cold weather.

The suction pressure control consists of a diaphragm-operated control valve controlled by 20-lb. air pressure from a pressure regulator installed at the gage board in the motor room. The pressure regulator is of conventional design with a bourdon tube, tested for 1,000-lb. pressure and having an adjustable setting range of 0 to 600 lb. The remote controller has indicating pressure gages on the gage board that show air pressure on the top of the diaphragm of the regulating valve as well as the suction control pressure. This is the first installation of its kind used by Stanolind. Heretofore all pressure-regulating devices have been controlled by direct oil pressure on the top of the diaphragm. The reason that the remote air-operated device is used is that pressures are too high to be carried directly on the diaphragm of a diaphragm motor valve.

An automatic sampler devised by Stanolind is used for sampling crude transferred from Ohio Oil Co. to Stanolind at the Elk Basin station.

There are three 30,000-bbl. floating-roof tanks at Elk Basin and one of the same type at Kirby. The floating-roof equipment is used for the purpose of minimizing the corrosion of the roofs and the bottoms due to the presence of hydrogen sulfide gas in the crude. The tanks are treated with Itasco tar for protecting bottoms and for a distance part way up the sides as well as the roof.

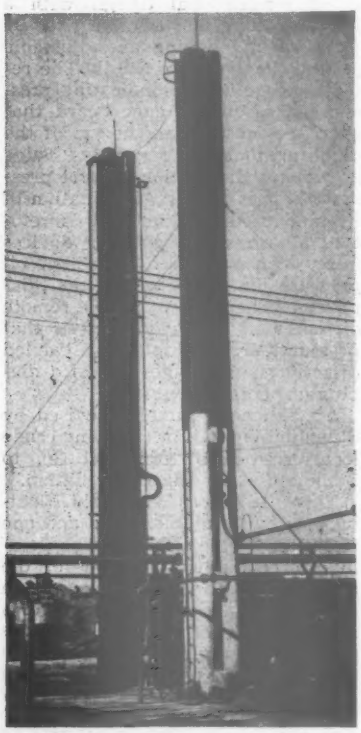
Building of the Elk Basin-Casper line, with larger-diameter pipe than required for current deliveries, is regarded as a forward step of much economic significance. The cost of a 12-in. line is comparatively not much greater than that of a combination 8-in. and 10-in. With the larger-diameter line immediate operating costs are consequently lower and ample capacity for the future is available which tends to stimulate efforts to discover new pools in the area which the system can serve.

Salvaged O.D. Pipe Makes Pipe Column

by R. B. Tuttle

OPERATING in depropanizing and in debutanizing service, the two columns shown in the photograph are built of 13-in. o. d. by ⅜-in. wall salvaged pipe. Designed by C. S. Brown, superintendent at Sinclair Refining Co.'s Sand Springs, Okla., refinery, the columns, a packed type, show performance equal to the conventional packed fractionator.

Consisting of four 52-ft. 5-in. lengths of 13-in. o.d. pipe welded to a 48-in. by 50-in. by ½-in. base plate, each column is packed with ceramic materials as needed for this particular service. General arrangement of an assembled column is shown in the nonscale drawing (Fig. 1).



General view of columns in depropanizing and in debutanizing service

Centered 12½ in. inside of the base plate, forming a 25-in. by 23-in. rectangle, the four pipes are tied together with headers at various points. The assembly makes a mechanically stable unit which, with suitable foundation, is self-supporting.

Headers made from the 13-in. o.d. pipe are located above the base plate as follows: (a) Drawoff and reboiler bottom connection, 15 in.; (b) reboiler top connection, 8 ft. 4 in.; (c) feed connection, 19 ft. 4 in.; (d) reflux connection, 49 ft. 4 in.; (e) vapor connection, 51 ft. 8 in.

The headers, cut to 3-ft. 6-in. lengths, are placed between the pipe columns, parallel to the longer (25 in.) center-to-center distance; cutouts are made in the header so that their centers are 25 in. apart with the cutout shaped to fit the pipe columns at right angles. Flat closure plates are fillet welded into each end of a header with one plate having a short nipple welded thereto for the piping connection. Because of the rectangular centerline location of the pipe columns all headers are parallel as are the piping connections.

A 3-in. diameter hole is cut into the pipe column on the centerline of the vapor header; a 4-in. diameter hole is cut for the reboiler header and 2-in. distribution pipes are welded into the columns for the feed and reflux headers.

Distribution pipes are located 2 in. below the header center and extend so that their outlets are at the center of the pipe columns. A standard 2-in. welding elbow, with its open end pointing downward, is attached to the end of the distribution pipes.

Four 1¼-in. diameter anchor bolts, approximately 3 in. from the corners of the base plate, extend up through holes in the base plate and

(Continued on page 98)

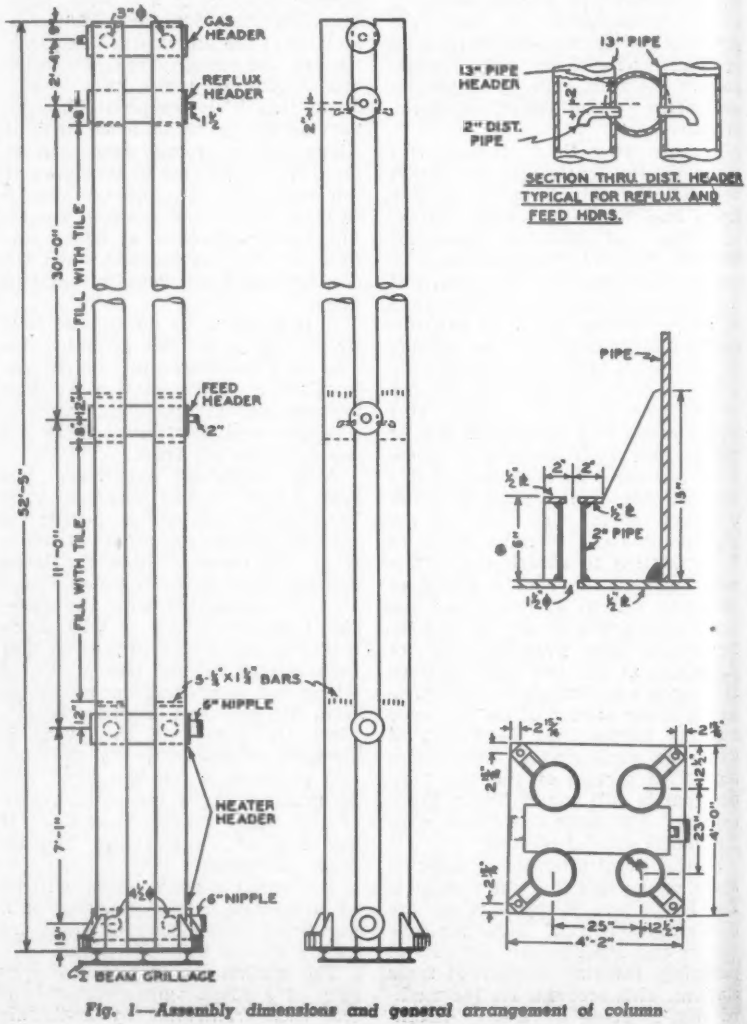


Fig. 1—Assembly dimensions and general arrangement of column

PROGRESS IN METALS

by W. L. Nelson
Consulting Engineer

Advancement in Low Temperature Welding

A REVIVAL of interest and great advancement in the use of low-temperature welding processes is being fostered by the Eutectic Welding Alloys Co. The welding of steels has been one of the major developments of the last decade and now it appears that a similar utilization of welding-like operations is fast being applied to other widely used alloys. To a large extent low-melting welding rod materials of the eutectic type are being employed. Thus, bonding is due in part to the formation of eutectic alloys with the material being joined (and the rod) without actual fusion of the parent material. Whereas brazing involves the use of a rod material that is greatly different from the material being joined, in eutectic welding the rod material is generally similar to the material being joined. Solders are usually eutectic-type materials but they also are unlike the material being joined, and they often have the disadvantage of melting at such a low temperature that they cannot be used for many services. In low-temperature eutectic welding the fusion temperature is intermediate between that of fusion of the metal to be joined and the exceedingly low temperature at which many solders melt. The somewhat low temperature of the eutectic-welding process in many instances is a great advantage because the temper or properties of the object being welded are not disturbed and yet the object may be used at fairly high-temperatures without softening of the eutectic material that constitutes the weld.

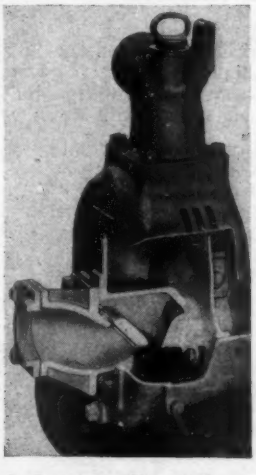
Rod materials are available for the welding of cast iron, alloy irons, steels, copper-base alloys (copper, brass, bronze, etc.), nickel alloys, aluminum and its alloys, and magnesium alloys. Rod materials for surface treatments for corrosion, heat resistance, frictional wear and abrasive wear are also being offered. The vast amount of repair of broken parts that is necessitated by the shortages of materials during the war is assisting in the development of this somewhat new method of welding.

The usefulness of eutectic welding may be illustrated by the salvaging of a zinc die casting which was a part of a fuel pump. The following statements are taken in part from the July issue of the Eutectic Welder which is published by the Eutectic Welding Alloys Co., 40 Worth Street, New York.

Zinc base die castings, which are normally difficult to repair, can be easily and effectively reclaimed with an improved gas welding rod that is now being marketed.

The new rod has a lower melting point and a still lower bonding temperature than the original alloy, which make it easier to apply without danger of damaging the parent metal. The improved rod is also easier to build up metal, has greater tensile strength, and matches the hardness of the die castings.

An example of what can be accomplished with this rod is shown in the accompanying picture of a zinc-



base fuel pump die casting which had the whole top section broken off. Previous attempts to build up the part with ordinary rods had been futile, for at the point at which the alloy had to be applied there was a hole approximately ⅜-in. to ½-in. diameter. This hole had to be bridged without the help of a back-up material inside the assembly.

The break was "V'd" out to about 90° angle and the section to be welded was cleaned thoroughly. The entire casting was preheated with an acetylene excess flame to about 700° F., at which temperature Eutec-Rod 195 bonds to zinc. Autochemic Eutector Flux 195 was sprinkled over the metal, and as soon as this melted, the rod was placed in front of the torch.

The lug was built up to its normal height in less than 5 minutes, and only 1 inch of a ¼-in. rod was used.

Strengthening Steel By Cold Work

PERFORCE many long or bulky steel members such as structural steel shapes, columns, posts, concrete reinforcing rods, sucker and pull rods, must be fabricated from relatively ductile steels because of their elongated shape. Nevertheless, the inherent ductility of such members is not always necessary in the finished product nor is it always desirable. Strengthening of such parts by heat treatment is very expensive because of their awkward length, and hence C. E. Reynolds in the J. Inst. Civil Engr's, Vol. 21, Feb. 1944, p. 227, discusses the strengthening of steels by coldworking, particularly for concrete reinforcing rods. An abstract of his paper by Metals & Alloys, July 1944, follows:

The continued national necessity for economizing in steel in wartime constitutes an added impetus to the use of high-strength steel bars for reinforcing concrete. Specifications for high-yield-stress steels for reinforcement are given, their properties examined with special reference to tests on cold twisted bars, and design problems relating to columns and beams are considered.

Twisting a square bar causes deformation in planes originally parallel or normal to the bar axis, and the major torsional overstrain in transverse planes is augmented by a small direct stress overstrain.

Within limits, the greater the degree of cold working (measured by the number of twists), the higher are the yield and ultimate stresses and the less is the ductility, as shown by the characteristic stress-strain curves for twisted bars.

There is for any given mild steel bar a certain number of twists that gives a specified elongation, another that gives a specified yield stress, and a third that gives a specified ultimate stress; the properties of the original bar determine the magnitude of these numbers.

A specified number of twists is, however, essential to insure that cold working does not reduce the margin between initial failure and collapse by bringing the yield stress too close to the ultimate stress, and likewise a minimum number of twists is necessary to warrant the bar being termed "twisted." An acceptable number of twists for square bars is a pitch of one complete twist on a length of 8 to 14 times the thickness.

At normal temperatures the stabilizing effect of cold working lasts indefinitely and prolonged heating up to 1,300° F. has little effect, although subjection for an hour or so to a temperature of 1,600° F. entirely removes the effect of cold working.

Water-Input Profile Measurements

*by R. L. McCormick and R. J. Pfister**

During development of a method for the measurement of water input profiles of a well (described in the December 16 issue) data were obtained and analyzed to indicate possible applications of the method and are presented in this article. A comparison is made between the profile measured by the method and that predicted from core analysis. On one well the beneficial effects of corrective shooting are shown. Three different types of selective plugging experiments and an acidizing experiment were performed and the results compared.

IN developing the method for determining the water-input profile of a well as described in a previous article,† some data have been collected. These are presented here as an indication of the type of data which may be obtained together with some of their possible applications. These data were obtained on only one well and, therefore, extensive general conclusions should not be drawn from the results.

The well on which the experiments were performed was designated as D and H No. 165 on the Andrus and McDowell lease on Columbia Hill, just outside of Rixford, Pa. This lease is on the eastern edge of the Bradford field about 12 miles east of Bradford. The well had been drilled about 2 years ago, chip cored and correctively shot. Since the time of drilling, the well has been subjected to a water flood at a pressure of about 1,000 p.s.i. At a total depth of 1,731 ft., this would give a sand face pressure of approximately 1,750 p.s.i. There was about 30 ft. of oil sand and the normal intake rate was about 60 bbl. per day.

*Division of Petroleum and Natural Gas, School of Mineral Industries, Pennsylvania State College. A paper presented at the eighth technical conference on petroleum production held at the School of Mineral Industries, Pennsylvania State College.

†A method for Determining Water Input Profile, R. J. Pfister and R. L. McCormick, The Oil and Gas Journal, December 16, 1944, p. 78.

In addition to obtaining the actual water-input profiles of a well, this method can be used to study the following problems:

1. Corrective shooting.
2. Selective plugging.
3. Overburden lifting.
4. Effective permeabilities.
5. Effective well radius.
6. Selective acidizing.
7. Bore-hole diameter.

Corrective Shooting

The technique of corrective shooting has been practiced for some time in the Bradford area with good results. However, no quantitative data are available for giving the variation in effective radius with variations in shot concentration. Since different permeability sands may show a different responsiveness to the shot, it is important to know the effect of the shot on individual strata.

Fig. 1 compares the air permeability with the measured and predicted water-input profile based on the core analysis. The well was shot from 1,718 to 1,731 ft. with 60 qt. of nitroglycerin in 5½-in. shells. The permeabilities varied from 46 millidarcies to less than 0.1. This part of the field had been subjected to an old natural flood; hence, when this well was drilled it was found that the more permeable sections were watered out. Saturations of the order of 400 bbl. per acre foot were found. It was the aim of the corrective shot to increase the effective radius to such an extent that the less permeable sands, containing the recoverable oil would take the major portion of the floor water. This has been accomplished to some extent since the shot section is taking a larger quantity of water than would be predicted from permeability alone. The input profile survey only covered the section from 1,710 to 1,725. As shown in the article by Pfister and McCormick, it takes increasingly longer times for the boundary to travel 1 ft. as it approaches either the top or bottom of the sand. The depths indicated were found to be about the practical limit to be covered in this well. The intake of the end portions not covered by the detailed survey are averaged.

Some early input profiles obtained at 200, 600, 800 and 1,000 p.s.i. are shown in Fig. 2. This is one of the earlier efforts and considerable improvement has been made since that time. These are presented to show the effect of increasing pressure on the input of a well rather than to show the similarity of the profiles.

Selective Plugging

In the past few years considerable experimentation has been carried out on the application of wax emulsions for the reduction of the input rate of high-permeability sands which have been watered out and are taking excessive quantities of water. This technique has shown varying degrees of success. It would be highly desirable to determine the extent of the plugging action on individual strata.

Several types of selective plugging techniques were tried on this well. In the first attempt the normal field technique was used. The pressure was removed from the well, 2 gal. of wax emulsion were poured in and full pressure was applied. When the emulsion was near the bottom of the sand, the pressure was reduced to approximately 100 p.s.i. for a period of 12 hours, after which full pres-

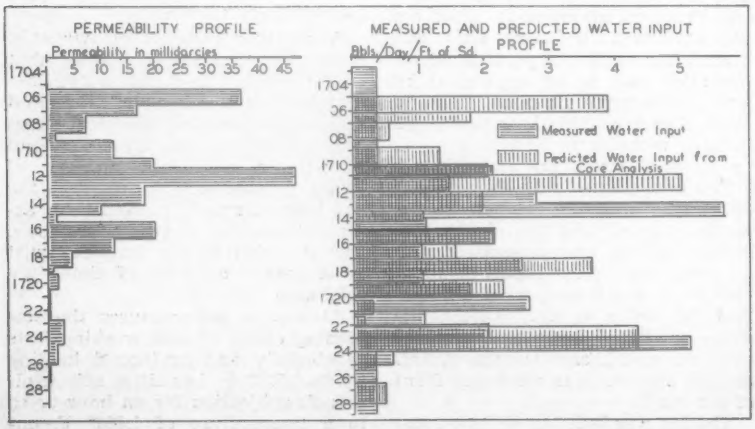


Fig. 1: Comparison of permeability profile and measured and predicted water-input profile showing effect of corrective shot on the water input of a well

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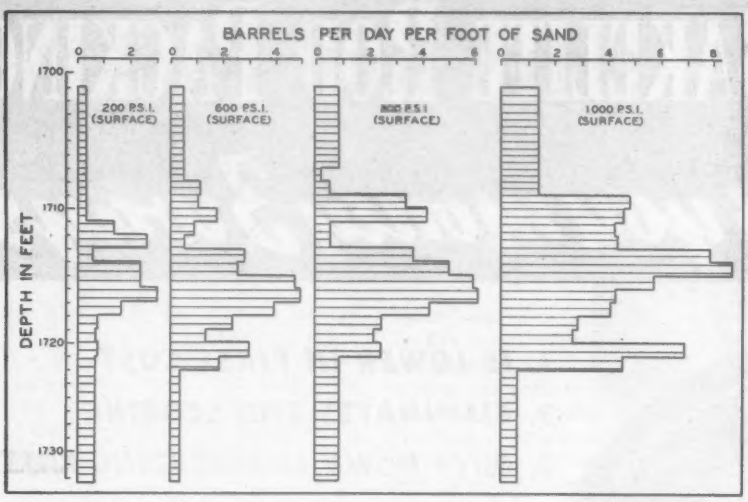


Fig. 2: Four early water-input profiles at various pressures. (Date of June 2-7-'44)

sure was again applied. The records of this plugging attempt were fragmentary and have not been analyzed.

Another method of introducing wax emulsion was tried in which a constant boundary was maintained between the shot and unshot sections to prevent the emulsion from entering the tight shot sands. One and one-half gallons of another wax emulsion were added by means of a pressure lubricator. When the wax reached the loose sands, the rate above the boundary dropped from approximately 15 bbl. per day to less than 1 bbl. per day. This rate was maintained for 24 hours, the brine boundary being held constant at 1,718 ft. with a well-head pressure of 980 p.s.i. Thus any beneficial effects of the plugging should not have been lost by backflow. It was found that the excess emulsion returned coagulated when the well was backflowed and brought back a considerable amount of ferric hydroxide with it. It was unfortunate that the emulsion was not stable in contact with the brine solution. The results are plotted in Fig. 3. It should be noted that some increase in conductivity is shown but only in the unshot portion and not in the shot portion. All parts of the shot section showed a decrease in conductivity. It was pointed out in a recent review on selective plugging* that some of the plugging action may be due to the penetration of the plugging medium into shot fissures. This may be indicated in these experiments in that plugging took place chiefly in the shot section. The 1-ft. section at a depth of 1,711 ft. has been opened up by this treatment. The section at 1,715 ft. was continually opening up during the five runs averaged in this figure. These runs covered a period of 48 hours. This opening effect may have been due to the wetting agent present in the wax emulsion, which was increasing the effective permeability of the sand to the water. The same phenomenon has been noted in both laboratory experiments and some field tests. It is believed that the action of the wetting agent which is necessary for stabilizing the emulsion may in some cases have a greater effect in reducing the oil-water Jamin action than the dispersed particles have in their plugging.

*"The Selective Plugging of Oil Sands, by S. T. Yuster and J. C. Calhoun. Producers Monthly, Vol. 8, No. 7, 31-37 (May 1944).

Different Plugging Method Tried

A different plugging method was then tried. Calcium chloride and sodium carbonate solutions were separately introduced into the well—one through the ¾-in. tubing to the bottom of the well and the other through the annulus between the ¾-in. and the 2-in. This gave a calcium chloride-sodium carbonate interface in the well—a boundary which could be followed by the probe. It was possible again to protect one part of the sand. By sweeping the interface up and down over the sand face, first one solution and then the other would penetrate. This would precipitate calcium carbonate in the sand pores itself. In addition, the calcium carbonate precipitated at the interface would settle out and be swept into the sand below. This is a disadvantage of this type of chemical plugging in that strata below the interface will be plugged whether this is desired or not. The results obtained after this plugging are plotted in the right half of Fig. 3. It should be kept in mind that these results are a combination of the effect of a selectively placed wax emulsion and calcium carbonate. Since the ideal plugging technique would involve the placement of the plugging agent opposite very definite strata, it is to be expected that these results would be more effective than the random-placed plugging media. This plugging incidentally withstood a backflow test before this profile was made. A severe electrical storm interrupted the power for about 3 hours during which time the high-pressure plant was cut off and the lease pressure dropped to 600 p.s.i.

After the wax emulsion and chemical plugging, the input of the well had been cut back to less than 10 bbl. per day. In an attempt to counteract the effect of undesired plugging, a selective acidization process was tried. Twelve gallons of

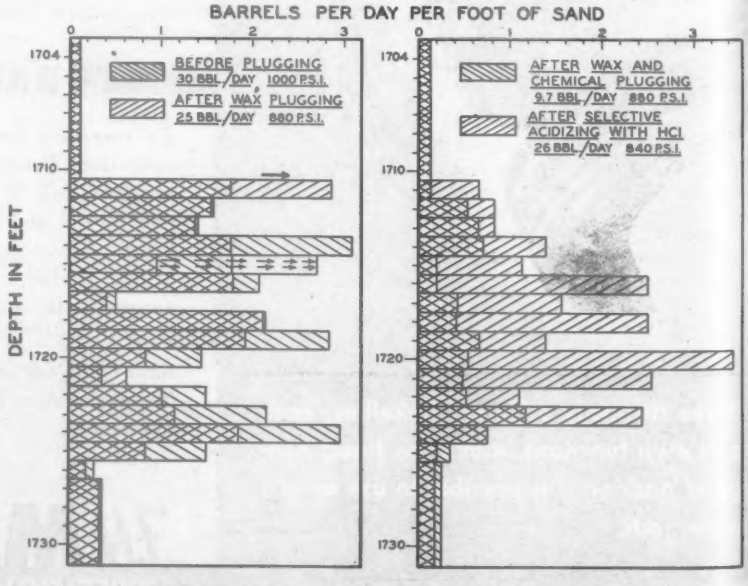

BARRELS PER DAY PER FOOT OF SAND
DEPTH IN FEET
BEFORE PLUGGING 30 BBL./DAY 1000 P.S.I.
AFTER WAX PLUGGING 25 BBL./DAY 880 P.S.I.
AFTER WAX AND CHEMICAL PLUGGING 9.7 BBL./DAY 880 P.S.I.
AFTER SELECTIVE ACIDIZING WITH HCl 26 BBL./DAY 840 P.S.I.

Fig. 3: Water-input profile before and after plugging

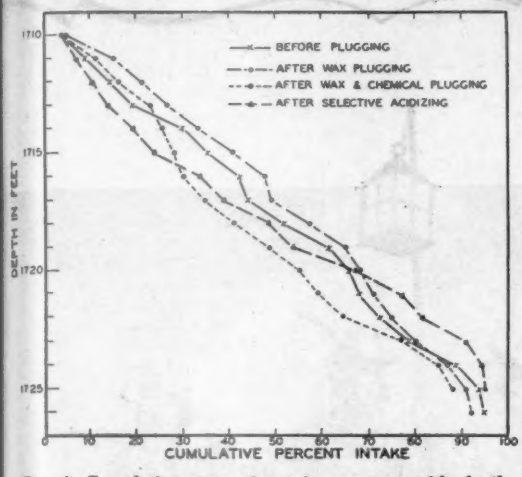


Fig. 4: Cumulative water input in per cent with depth

muriatic acid were introduced into the bottom of the hole through the ¾-in. tubing since it was desirable to open up only the shot section of the well. The right half of Fig. 3 shows that this section of the sand after acidizing is taking the greater proportion of the flood water. The acid got up as high as 1,715 ft. during its application. The large increase in conductivity of some of the strata in the shot section would indicate the presence of some acid-soluble material, such as rust or an unwanted plugging action by the calcium carbonate, the possibility of which was mentioned previously.

Cumulative water input in per cent is plotted against the depth (Fig. 4). The before-plugging curve is the base line for this graph. Curves falling above this base line show that that section of the sand is taking more of the flood water than it had taken before treatment. Curves falling below this base line show that that section of the sand is taking less than before treatment. Probably the ideal curve for this particular well would be the one in which the upper part of the sand was represented by a steep line and then the remainder of the sand by a diagonal to the 100 per cent cumulative intake at the bottom of the hole.

Some future applications of this water-input profile technique to water-flooding problems are as follows:

Overburden Lifting

There is a great deal of controversy among water-flood engineers as to the maximum safe pressure for flooding and how this maximum pressure can be determined. It is generally agreed, however, that if sufficiently high pressures are applied, the formations will part and water will be conducted to the producing wells without passing through the sand proper. Where this break occurs, and if it is only at one point, are questions which need to be answered in order to understand this phenomenon.

Although very careful determinations of permeability are made in the laboratory on extracted samples of the formation, there are no comparably accurate measurements of the actual effective permeabilities available to correlate with laboratory permeability measurements. From such a correlation a better prediction of field behavior could be obtained.

Effective Well Radius

Since the shot responsiveness of a formation will determine the size of the shot needed in completing a well, a knowledge of the change of effective radius with a variation in such conditions as sand type, type and quantity of tamping, shot concentration, type of explosive, permeability, and fluid content is needed. All these factors will determine the effective radius, which in turn will control the rate of flow into or flow out of the formation. It can be seen therefore, that the effective shot radius is one of the most important variables which the oil producer is capable of controlling, at least to a limited extent since such

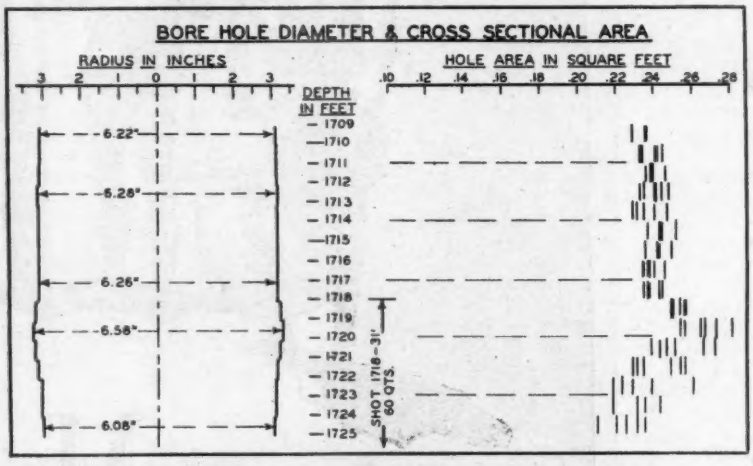


Fig. 5: Diameter and cross-sectional area of hole, calculated from Equation (12). (See "A Method for Determining Water-Input Profile," The Oil and Gas Journal, December 16, 1944, page 83)

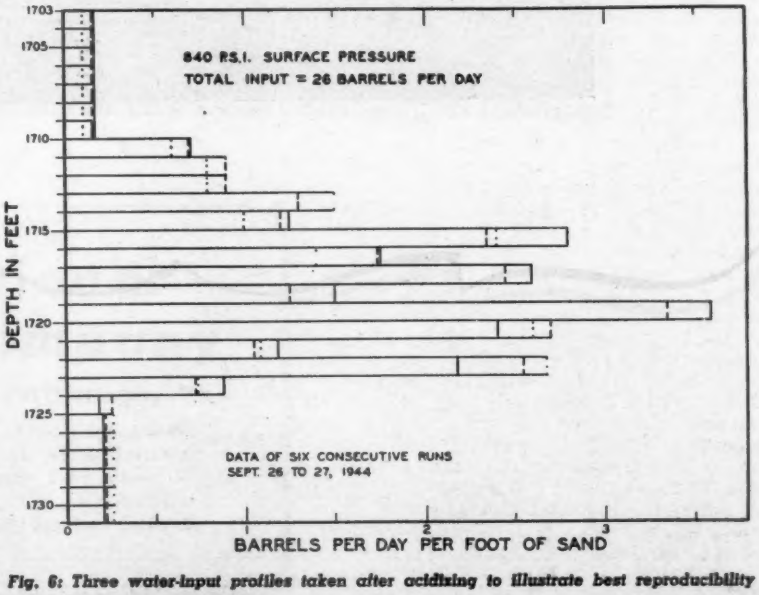
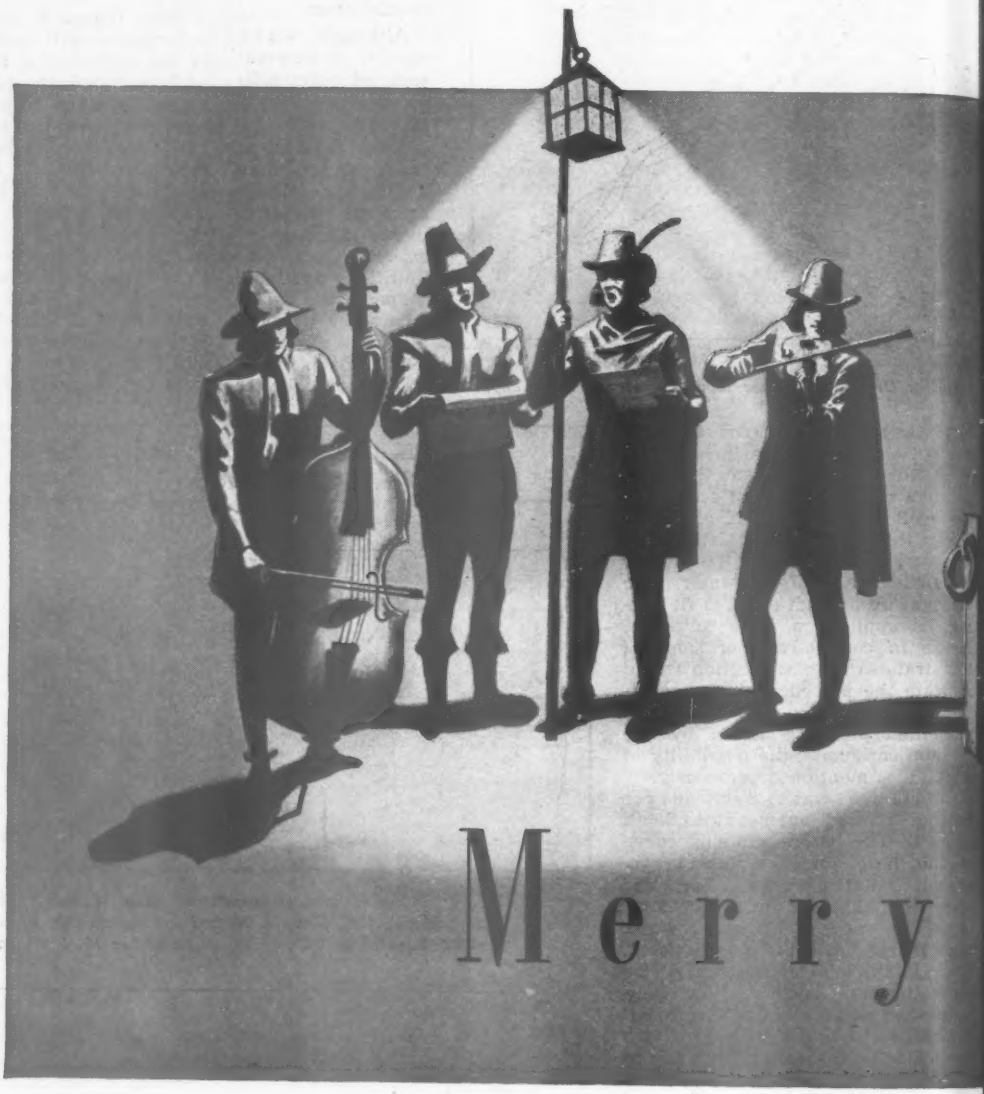
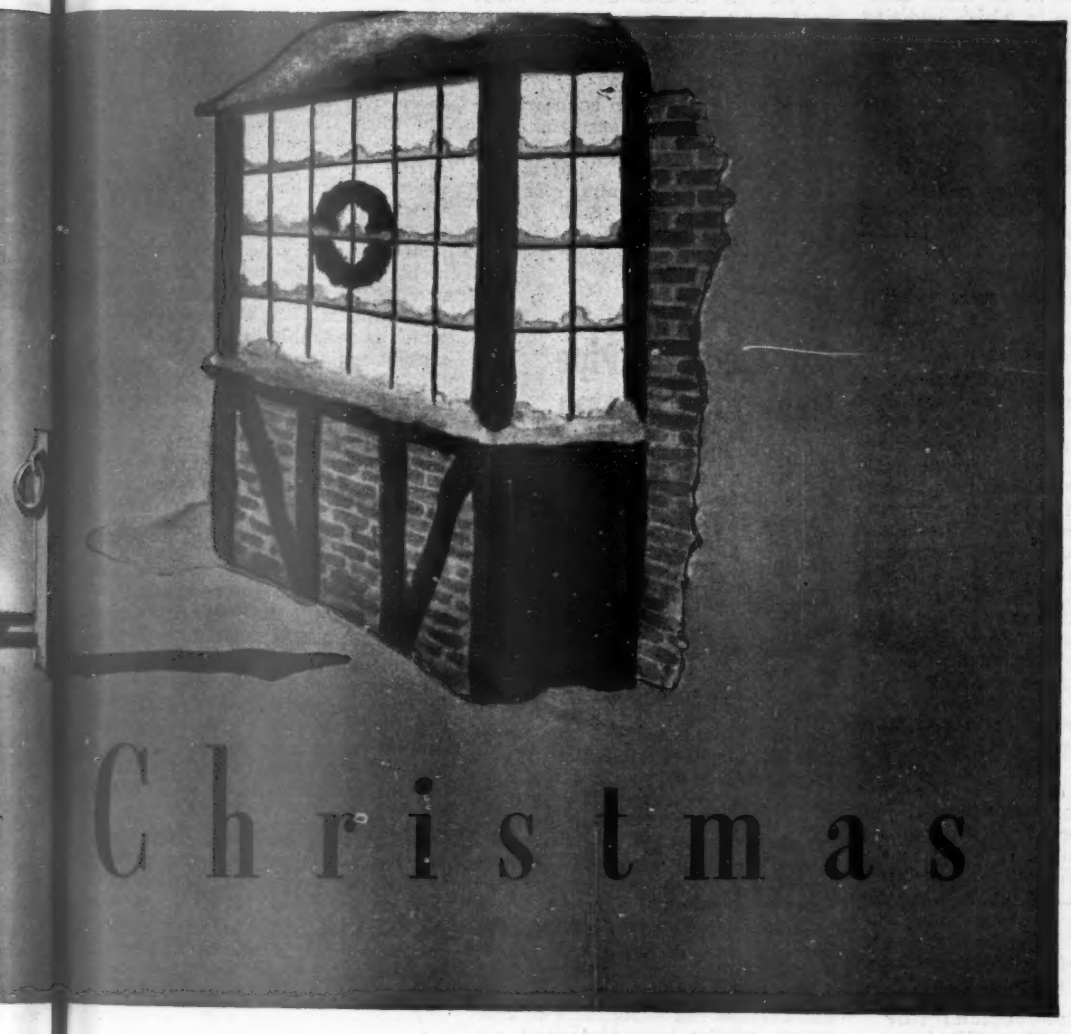


Fig. 6: Three water-input profiles taken after acidizing to illustrate best reproducibility


Merry



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control will determine the rate of recovery.

Selective Acidizing

While the application of acidizing has been very limited in water flooding because of the lack of acid-soluble minerals in the sand, there are certain cases in which acidizing will be found to be beneficial. For example, if a well has been subjected to the plugging action of a water containing a suspension of an acid-soluble material, such as rust, it will be possible to remove this deposit by the application of an acid; however, it may be desirable to unplug only those sections which are still capable of producing oil and leaving plugged those sections which are watered out. This problem has been discussed previously in this article.

Bore-Hole Diameter

In the placement of chemicals or other materials in a shot well for one purpose or another, it may be necessary to bring these materials up to a certain position in the hole. This is only possible if the physical dimensions of the well are known. In Fig. 5 the radius and the cross-sectional area of the hole have been plotted as a function of the depth. The hole areas, from six different runs, are plotted and show fair agreement. A small billowing-out effect in the hole diameter can be noted which agrees with the location of the shot. There are no extreme irregularities, however. This shows only a maximum hole-diameter difference of ½ in. It would follow that the chief effect of shooting is in the creation of fissures.

The best reproducibility obtained to date with this method is shown in the six consecutive runs after acidizing. About 36 hours were required for all of these runs. The measured input rates in barrels per day per foot of sand are recorded in Table 1 and are plotted in Fig. 6.

TABLE 1 — REPRODUCIBILITY OF WATER-INPUT PROFILES

(Six consecutive runs after acidizing)
From 9:40 a.m., Sept. 26, 1944, to 8:35 a.m., Sept. 27, 1944.

Depth (ft.)	Input, barrels per day per foot — Runs 18 & 19	20 & 21	22 & 23	Average
to 1,710.5	1.20	1.20	1.10	1.17
1,711.5	0.70	0.70	0.60	0.67
1,712.5	....	0.90	0.80	0.85
1,713.5	....	0.90	0.80	0.85
1,714.5	....	1.30	1.50	1.40
1,715.5	1.25	1.20	1.00	1.15
1,716.5	2.80	2.35	2.40	2.52
1,717.5	1.75	1.75	1.20	1.57
1,718.5	2.60	2.45	...	2.53
1,719.5	1.50	1.25	...	1.37
1,720.5	3.60	3.35	...	3.48
1,721.5	2.40	2.70	2.60	2.57
1,722.5	1.20	1.05	1.08	1.11
1,723.5	2.18	2.55	2.68	2.47
1,724.5	.88	.72	.73	.78
1,725.5	.18	.25	...	.22
to 1,731.0	1.16	1.18	1.46	1.19
Total	26.60	25.80	25.30	25.90

The sample calculation in Table 1 of the previous article* gives the results of the first pair of these runs.

It might be well to reemphasize that the data presented here are from only one well and that they were accumulated while the method for the measurement of input profiles was being developed. It has been presented to indicate the potentialities of the method and its method of application.

The authors wish to acknowledge the cooperation, assistance and many suggestions offered by R. V. Hughes, J. P. Jones and D. T. Andrus and his field crew. The numerous discussions held with Dr. S. T. Yuster, Mrs. June Pfister and staff members have been especially helpful.

*Loc. cit.

Salvaged O.D. Pipe Make Pipe Column

(Continued from page 88)

the 2-in. pipe guides in the double-gusset plate stiffeners. The stiffeners are placed 4 in. back to back and extend 15 in. up the pipe column. A 4-in. by ½-in. by 6-in. plate having a 1½-in. diameter drilled hole on center provides a bearing for the anchor-bolt nut. Shape of the gusset plate is approximately as follows: 15 in. along the pipe column, 8¼ in. along the base plate; 5½ in. perpendicular to the base plate; 4 in. parallel to the base plate from which point it runs at an angle to the point on the pipe column that is 15 in. above the base plate. After attaching to the gussets, the bearing plate is approximately 6 in. above the top of the base plate. The gussets are attached to the columns and base plate by welding.

Reinforcement for the base plate is made up of 10-in. standard I-beams formed into a grillage which is welded to the base plate. The main beams run along the 4 ft. 2 in. length of the base plate and are centered 5 in. and 18 in. to the right and left of the base plate centerline. Cross beams having coped ends are placed perpendicular to the main beams. One set of cross beams is centered on the base plate centerline, one set 6 in. inside of the right end of the base plate and one set 6 in. inside the left end.

Packing supports which are made from 1¼-in. by ¼-in. bars are located 9 ft. 4 in. and 20 ft. 4 in. above the base plate. Five slots, approximately 1⅜ in. by ⅜ in., are cut in each side of the pipe column for the 1¼-in. by ¼-in. bars.

Because of difficult welding conditions indicated when the columns were worked up as a unit, a procedure was set up whereby the columns were divided into subassemblies for welding. Main parts of the bottom subassembly consist of the base plate, gussets, reboiler headers and the pipes which are cut to 9-ft. 2½-in. lengths. This subassembly extends 10½ in. above the center of the top reboiler connection. Another subassembly, the midsection of the column, consists of the 1¼-in. by ¼-in. bars, feed header and pipe which is cut to 11-ft. lengths. This subassembly extends to a point 10½ in. above the feed header center. The third subassembly, the top portion of the column, consists of the 1¼-in. by ¼-in. bars, reflux and vapor headers and the pipe columns which are 32 ft. 2½ in. long. The top or bottom subassembly, if completed first, may be used for alignment of the second or midsection and the midsection for aligning the remaining section. Close alignment, which is desirable in final assembly, may be maintained by tack welding the subassembly that is being worked up to a completed subassembly. Prior to final assembly, which includes the welding of the circumferential joints between subassemblies, the desired depth of packing is placed in a section. Where the section to be packed is placed in a sloping position the problem of filling the section will be greatly lessened over that of attempting to fill the section when it is in a horizontal position.

The column may be assembled on its foundation by the subassemblies in a vertical position or the complete assembly may be made on the ground when the column is in a horizontal position; available hoisting equipment no doubt will be the governing factor in the case.

A flat plate makes the top head and the base plate the bottom head; this, if not desirable, may be handled to meet the particular needs.

General arrangement of the completed column is shown in Fig. 1; the photograph shows two completed units in operation.

Wilson A. Chapman, who was a petroleum engineer for the old Shasta Oil Co., in Midland, Tex., until 1940, when he joined the U. S. Army Air Forces, received promotion recently to lieutenant colonel. When last heard from by friends he was operations officer of a P-51 fighter group in Italy.

H. G. Henderson, petroleum engineer for Severns Drilling Co., California drilling contractor and producing company, has been elected chairman of District 18 of the Conservation Committee of California Oil Producers. This district includes Brea Olinda, Buena Park, Chino, Kraemer, Puente, Richfield, Yorba Linda, East and West Coyote.

Methods of Determining Viscosity of Oil

ACCURATE measurements of the viscosity of crude oil are most important in determining flow rates in reservoir rocks, calculating flow of oil through pipes, and, in fact, in almost all operations where fluid flow is involved.

Theory.—Viscosity of oil is a measure of its ability to flow and is the most convenient means of expressing its fluidity in precise terms. The unit of measure of viscosity commonly employed in testing oil is the centipoise. The viscosity of distilled water at 68° F. is 1 centipoise. Hence, the viscosity of oil, if measured at 68° F., may be visualized as a multiple of the viscosity of water. Viscosity may be calculated, therefore, by measuring the rate of flow of oil through a capillary tube which has been previously calibrated with water. For example, if it requires 10 seconds for water to flow through a tube and 100 seconds for oil to flow through the same tube, then the viscosity of oil would be 10 times that of water or 10 centipoises. It is perhaps better to use an oil of known viscosity instead of water for the comparison, since, if water is used, there are slight corrections to be made due to differences in surface tension of water and oil. A drop in temperature increases the viscosity of the oil and loss of dissolved gas from the oil also makes it more viscous. To compare two oils measurements should be made at the same temperature.

Method of making viscosity measurements.—Viscosity measurements may be made conveniently and accurately in the laboratory by using a capillary tube viscosimeter, a modification of the original Oswald apparatus. Two modifications of the U-tube are now in use, the Ubbelohde type and the Fenske type (Fig. 1). The Ubbelohde type is slightly more accurate; the Fenske type, slightly easier to handle and less subject to breakage. The Ubbelohde instrument is operated as follows: Tube No. 1 is filled with oil up to the indicated mark on the bulb, placed in a thermostasically controlled water bath having glass sides, and allowed to stand sufficiently long at a constant temperature to come to the exact temperature of the water bath. Then tube No. 3 is closed at the top by the finger, and suction is applied to capillary tube No. 2 by attaching a small suction tube until the oil is drawn in above the upper expansion bulb. Then the finger is removed from No. 3 tube, the suction tube is removed from the capillary, and the oil allowed to flow through the capillary tube until it has reached the mark between the upper and next to the upper expansion bulbs. The oil is allowed to continue to flow on down through the second expansion bulb until the top of the oil column reaches the mark just below the second expansion bulb. The time required to flow between the two marks is recorded and the viscosity read from a viscosity chart (Fig. 2). These charts are made up by measuring the time of flow of oils of known different viscosities through the capillary tube at a given temperature, plotting the time periods on cross-section paper, and drawing a line through the points. If the readings are correct, the line should be straight. The U-tube should be cleaned carefully, first with naphtha, then with dilute chromic acid solution, and finally with distilled water; then it should be dried by drawing a current of warm, dry air through the instrument before each viscosity measurement. However, once the calibration chart for a viscosimeter is made, the determination of the viscosity of an unknown sample is simple. For example, suppose it requires 200 seconds for the oil to drain between the marks on the capillary tube No. 2 when the temperature in the water bath is 100° F. Suppose the calibration chart is like that illustrated in Fig. 2 and made up with standard oil at 100° F. Then follow the 200-second ordinate line on the chart vertically until it intersects the line A-B connecting the calibration points. Mark the point and draw a horizontal line along the abscissa line toward the left until it intersects the viscosity scale on the chart. Read the viscosity. It is 3.3 centipoises.

The manipulation of the Fenske U-tube is practically the same as that for the Ubbelohde.

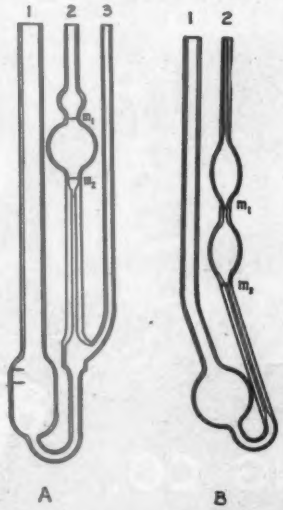

Fig. 1: U-tube viscosimeters used in testing oil. A, Ubbelohde type; B, Fenske type

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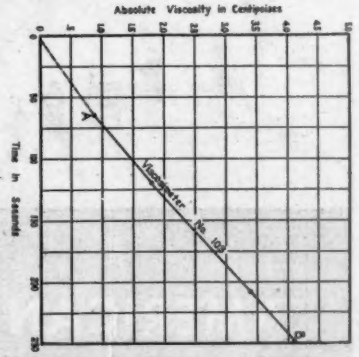

Fig. 2: Calibration chart for U-tube viscosimeters. A separate chart needs to be made for each viscosimeter

Series prepared by F. B. Plummer, professor, petroleum engineering school, University of Texas

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The Refiner's Notebook

A WEEKLY FEATURE OF THE OIL AND GAS JOURNAL

Combination Topping Plants

TOPPING alone is not usually an economic operation, it must be conducted in conjunction with other processes. A combination of topping and some other process permits converting the nearly valueless topped crude oil into more valuable products and may permit the operation of topping to be conducted almost completely by heat exchange.

1. Topped crude oil is nearly valueless if sold as black fuel oil. It can be converted in large portion into cracked gasoline by cracking; into asphalt and a gas-oil charge stock for thermal or catalytic cracking; or into asphalt and lubricating oils.

2. Exchange heat from reducing, vacuum or cracking plants is usually not sufficient to supply all of the heat required for topping but in some situations a cracking plant can do so.

Some of the ways that topping can be used in combination with other processes is indicated in Fig. 1. The figure shows a skeletonized flow diagram of the topping part of the operation with major emphasis placed on the relationship between topping and the combination process. Some of the possible combination operations are:

1. Reducing at atmospheric pressure is accomplished by heating the topped crude oil and fractionating it into gas oils and reduced crude oil. On the figure this operation is marked 1. The crude oil may be heated by straightrun gasoline condenser A, gas-oil condenser B on the top of the reducing tower, by heavy gas oil (c) from the side of this tower, and by exchanger D which utilizes the heat in reduced crude oil. Some refiners reduce to asphalt at atmospheric pressure rather than make the reduced crude oil indicated here. In case the reduced crude oil is to be cracked or coked after leaving the reducing tower, exchanger D would not be used. The crude oil may attain a temperature of 400°-440° F. in such a system.

2. Vacuum distillation for producing wax distillate, distilled cylinder stock (or other lube stocks) and asphalt is indicated on the figure by number 2. The same exchangers (i.e., A, B, C and D) as those used in atmospheric reducing are employed, but the temperature attained by the crude oil is less because the temperatures of the hot stocks from a vacuum tower are lower. The crude temperature may be 320°-380° F., and the amount of tar or asphalt may be so small that exchanger D is not justified.

3. Cracking or coking provides enormous amounts of heat because of the high reaction temperature of 880°-1,000° F. and because of the necessity of recycling large amounts of stock. By using exchangers A, B and D (see No. 3 on figure) a crude temperature of 360°-450° F. may be attained.

4. Cracking of crude oil by feeding it directly into a cracking plant is not shown on the figure. Such an operation is equivalent to bringing the crude oil to a temperature of 500°-600° F. but it is heated by mixing it with hot stocks in the cracking plant rather than by heat exchangers. It has the disadvantage of not permitting the separation of straightrun gasoline, kerosene, etc., which are valuable for some purposes or because they do not require the chemical treatment given to cracked materials.

The heat stored into the crude oil by the combination processes (except Method 4) may be sufficient to do as much topping as is desired but more frequently the exchange heat is not sufficient for more than stabilization of the crude oil to remove gases (see figure) or to distill a small amount of light gasoline in a preflash tower. Additional heat must usually be provided by the heater shown in the figure.

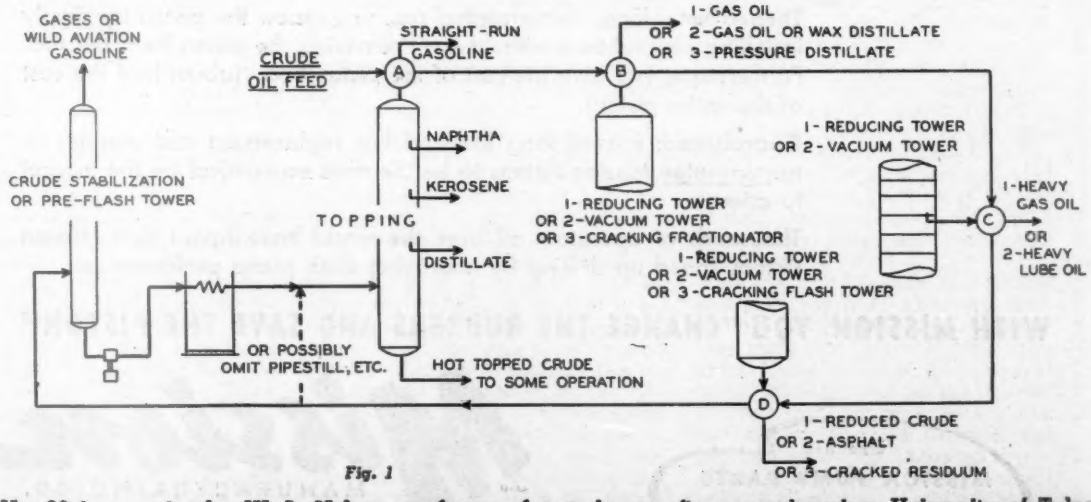

Fig. 1

No. 23 in a series by W. L. Nelson, professor of petroleum refinery engineering, University of Tulsa

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Natural-Gasoline Plants In Texas Total 128

AUSTIN.—Texas has 128 natural-gasoline plants, which, operating at capacity, can process 5,237,528,000 cu. ft. of natural and casinghead gas daily, according to a booklet prepared by the Statewide Committee of Oil Operators in its fight against ratification of the Anglo-American oil agreement. The state has 113 refineries, with a total daily crude-oil capacity of 1,456,350 bbl., and 37 carbon-black plants capable of extracting carbon black from 1,030,750,000 cu. ft. of natural gas daily.

The oil industry in Texas has 73 pipe lines with a total length of 34,828 miles. It takes 9,000,000 bbl. of crude oil to fill this pipe-line system.

Leases for oil and gas total 48,500,000 acres. Annual rentals and bonuses on oil and gas leases in the state aggregate $70,000,000. There are 169,400 persons employed in all branches of the oil industry in the state, with an annual payroll of $331,847,050.

There are 140 counties in Texas producing oil and 36 counties producing gas. There are 1,012 oil fields with 2,914,096 productive acres. As of November 4, 1944, there were 101,421 producing oil wells and 5,686 producing gas wells in the state.

Sam Jones Urges Southern States to Conserve Gas

SAN ANTONIO.—Conservation of natural gas from Texas and Louisiana as "a key to industrialization of the South and the Southwest" was urged by Sam H. Jones, former governor of Louisiana, in an address before San Antonio Manufacturing Association December 12.

Louisiana had fought efforts of outside interests to pipe gas from that state, Jones said, adding: "You in Texas are to suffer the greatest blow. Your gas will become the happy hunting grounds of the eastern industrialists. There is pending an application by the Reserve Pipeline Co. to take your South Texas gas. There is pending an application by the Hope Natural Gas Co. to take your North Texas gas. There is proposed a pipe line to California to take your West Texas gas." He named other projects which he said would affect East Texas fields and other fields throughout the Southwest.

If all these pipe lines should be built, the speaker indicated, it might be that Texas some day would be importing coal for fuel while her natural gas was being moved to states producing the coal.

Operators Want Rehearing In Cabot Carbon Case

OKLAHOMA CITY.—Operators in the Guymon-Hugoton gas field of Texas County have filed exceptions and have asked the state Corporation Commission for a rehearing in the case of Cabot Carbon Co., which on November 24 was granted a "war emergency" permit to build a channel-process carbon-black plant near Guymon. The projected plant is to have a daily capacity of 30,000,000 cu. ft., and the commission fixed the price of natural gas at 5 cents per 1,000 cu. ft.

Petitioners for the rehearing are Cities Service Gas Co., Magnolia Petroleum Co., Panhandle Eastern Pipe Line Co. and Northern Natural Gas Co. They assert that the commission erred when it accepted as evidence telegrams from "outside sources," and that the order was contrary to evidence submitted at the hearing on September 18.

Petitioners assert there is an ample supply of natural gas in other fields for such an emergency plant, and that if permitted they would detail such sources of supply. Petitioners also would conserve the supply of gas in the Guymon-Hugoton area for "superior uses."

Telegrams from the chemical division of War Production Board cited the carbon-black shortage and "insufficient production to meet the nation's military and essential civilian tire program."

On November 21, W. F. Twombly of the WPB chemicals division, wired the commission that "it is essential to the successful prosecution of the war" that the plant be constructed and that "continued delay will impede the war effort."

After quoting the full telegram from Twombly, the commission wrote in its order, "In peacetime conditions it may be determined that the use of sweet gas in the manufacture of carbon black is waste," and "solely for the purpose of aiding the war effort," the commission would grant such permit.

The order granting the permit fixed the following conditions and limitations: "(1) Same shall continue only for the duration of the war and 6 months thereafter, at which time it will expire by its terms without additional order of this commission; and (2) the price of gas used in the manufacture of carbon black in said plant shall be at least 5 cents per 1,000 cu. ft., and if less than 5 cents, this permit shall immediately become inoperative."

Moscow Enjoys Prospect Of Bigger Gas Supply

MOSCOW.—Residents of this city express pleasure over the prospect that upon completion next December of a 450-mile pipe line from Saratov they will have five times as much natural gas as is available now and that many hardships of long, cold winters will be ended. Saratov lies southeast of here, on the Volga River, and several thousand workers will soon be at work on the pipe-line project, the newspaper Pravda says.

FPC Suspends Increases For Two Gas Companies

WASHINGTON.—Federal Power Commission has suspended proposed increases in rates for natural gas sold by Allegany Gas Co. and North Penn Gas Co., which would cause an estimated increase of $44,140 yearly in the amounts paid by five northern Pennsylvania and western New York distributing companies. The commission will hold a hearing in the Allegany case January 24 and in the North Penn case January 25. The two companies, which are affiliated, have their principal offices at Port Allegany, Pa.

The distributing companies are Crystal City Gas Co., Addison Gas & Power Co., Southport Gas Co., New York State Electric & Gas Corp., and Keystone Gas Co. The commission's orders suspend the proposed increases until May 1, 1945, or until they are made effective in the manner prescribed by the Natural Gas Act.

Stating that the new rate schedules may result in excessive rates to the distributing companies and may place "an undue burden upon ultimate consumers of gas," the orders provide that the burden of proof to show that the increases are just and reasonable shall be upon the two companies. The proposed schedules would result in an increase of about 6 per cent.

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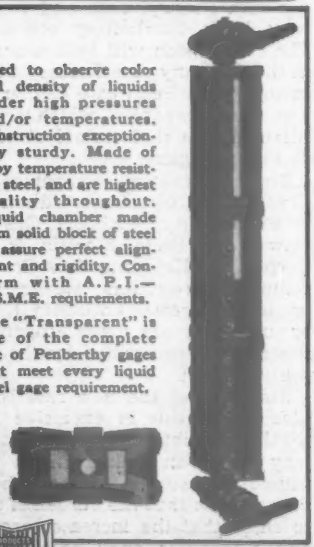

PENBERTHY INJECTOR CO.
DETROIT, MICH. Canadian Plant WINDSOR, ONTARIO

REFINING

Knock-Testing Forum Facts To Be Made Available

Much of the information presented at the recent series of regional knock-testing forums conducted by the Coordinating Fuel Research Committee of Coordinating Research Council, Inc., will be assembled in two manuals, and these are to be made available soon to owners of CFR knock-testing equipment through the council.

Plans to improve methods of operation and maintenance of the engines by which all gasoline furnished the armed forces is tested for knocking characteristics were discussed at the six forums, which began in Philadelphia, November 27 and closed in Richmond, Calif., December 15.

The fact that responsibility for the quality of every gallon of gasoline used in our fighting and training planes rests on the shoulders of the operators of the CFR engines used to test high-octane gasoline was stressed by C. B. Veal, secretary and manager of the council at the first of the forums. More than 500 of these operators, representing approximately 150 laboratories, were informed of the latest improvements in equipment and of recommended sound periodic overhaul practices, which should materially decrease tie-up time caused by engine failures. They were advised how to check the engine to determine in what respects it was operating correctly and thus discover, by elimination, the sources of error. Each forum included an inspection trip to a well-equipped laboratory.

Standard of California to Make Phthalic Anhydride

SAN FRANCISCO.—Standard Oil Co. of California has started construction at Richmond of a plant to manufacture phthalic anhydride, an essential constituent of high-grade paints and other surface coatings for use where strong resistance to weather is required. This petroleum chemical is used also in the manufacture of synthetic rubber, resins and plastics. Output of the new plant will supply Oronite Chemical Co., a subsidiary. The process was developed by California Research Corp., another subsidiary.

Production of 100-octane gasoline at the parent company's converted toluene plant at Richmond is exceeding the volume predicted. This is being accomplished mainly by fuller utilization of a catalyst developed by company scientists. Other oil companies are purchasing supplies of this catalyst from Standard of California. Two principal units of the 100-octane plant at Richmond are almost completed.

Fuel-Oil Rations to Remain At 10 Gal. Per Unit

WASHINGTON.—Fuel-oil rations will remain at 10 gal. per unit for a period beginning December 11 in the Pacific Northwest and December 18 in all other areas, Office of Price Administration announced last week. The extension of this rationing rate was decided upon as a result of unusually heavy military needs and transportation problems.

OPA said Period 3 coupons, valued at 10 gal. per unit, would also become good December 18 in midwestern and southern states under fuel-oil rationing, since Periods 2 and 3 are combined in these areas. Period 3 unit values for the Pacific Northwest and eastern states will be determined about January 8 in the West and January 15 in the East when the third period begins in these areas.

Calls Humble Achievement Teamwork at Its Best

HOUSTON.—"American teamwork at its best," commented Maj. Gen. Hubert R. Harmon, chief of the Army Air Force personnel distribution at Randolph Field, in his address at exercises held December 14 at Baytown celebrating production of the billionth gallon of 100-octane gasoline at the Baytown refinery and ordnance works of Humble Oil & Refining Co.

Other speakers on the program were Rear Adm. William H. Smith, director of naval transportation service of Office of Naval Operations; Bruce K. Brown, who recently resigned as deputy petroleum administrator to return to his post with Standard Oil Co. (Indiana) as general manager of research and development work; President H. C. Wiess and Vice President Hines Baker, of Humble.

Thousands of company employes and visitors attended the celebration. A big industrial exhibit depicted Humble's war effort. Brown declared that without the high-powered motor fuel produced by Humble, America's fighting forces would be helpless.

Tax on Gasoline to Finance Airports Draws Fire

HARRISBURG, Pa.—A suggestion that states consider taxation of aviation fuel as a method of financing airport development drew opposition at the recent interstate civil aviation conference. "The airline industry is opposed to any gasoline tax," declared R. M. Averill, assistant to the president of Pennsylvania Central Airlines, adding that a heavy tax "would put the entire industry into a chaotic condition financially."

Maj. Arthur H. Tully, Jr., Massachusetts director of state aeronautics, raised the question of the tax during discussion of model airport development and airport zoning legislation at the concluding session of the 2-day meeting, attended by representatives of 15 states.

"The fate of a lot of the things we propose to do," said Tully, "depends on our aeronautics departments getting some income in the form of taxes."

Operation of Abasand Plant Delayed by Man Shortage

EDMONTON, Alta.—Difficulty in obtaining steamfitters, welders and other skilled help has delayed operation of the Abasand Oils processing and refining plant near McMurray, in the tar sand area of northern Alberta, according to G. B. Webster, vice president and managing director. Material is on hand to complete construction, and it is hoped to have the plant in operation this month.

Sun Passes Billion-Gal. Mark at Marcus Hook

PHILADELPHIA.—Sun Oil Co. has blended more than 1,000,000,000 gal. of aviation gasoline at its Marcus Hook (Pa.) refinery since Pearl Harbor, J. Howard Pew, president, announced this week. On this total, 75 per cent was the highest-grade 100-octane fuel and the rest was about evenly divided between 91-octane and 87-octane, both designed exclusively for aviation.

The billionth gallon went through the blending tanks December 16, and it was withdrawn to be put into capsules as mementos of the achievement.

Pointing out that Humble Oil & Refining Co. last week blended its billionth gallon of 100-octane gasoline, Pew said Sun's performance further emphasized "the outstanding fine contribution which the entire American petroleum industry is making to the war effort."

Pew disclosed that the Marcus Hook refinery, in reaching the billion-gallon aviation-gasoline mark, had blended 42,000,000 gal. of 100-octane aviation gasoline in each of 4 months this year, a record no other refinery has attained. He also revealed that during the critical months of the Normandy invasion last summer, the Marcus Hook plant exceeded by 5,142,000 gal. a maximum quota set for it by the military authorities for production of 100-octane gasoline components.

Blending 1,000,000,000 gal. of aviation gasoline since Pearl Harbor is equivalent to 635 gal. a minute.

PAW Directs 13 Refiners To Share Their Crude

CHICAGO.—Thirteen refiners in District 2 (Middle West) will share their crude with 24 other refiners of that district during December, in conformity with a directive issued by Petroleum Administration for War under the wartime crude-allocation program. The 24 refiners accordingly will receive a total of 17,475 bbl. of crude daily from the 13 who are more favorably situated with reference to supplies.

This represents a slight drop in the number of supplying companies and in the quantity of crude to be shared, but a rise in the number receiving aid. In November there were 16 refiners shipping an average of 19,975 bbl. of crude daily to 14 other refiners in District 2 under the allocation plan, which is supervised by the crude-supply panel of the district refining committee.

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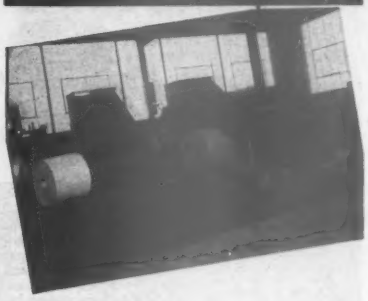

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PIPE LINES

Creole Completes Line In Eastern Venezuela

Creole Petroleum Corp. has recently completed a 116-mile 16-in. crude-oil pipe line from Jusepin to Puerto de la Cruz in eastern Venezuela. Construction was handled by Oklahoma Contracting Co., S.A., which has had a spread working on the project. Completion was delayed by the late arrival of a shipload of pipe. Operations of the Oklahoma Contracting firm have been carried on under the direction of M. K. McFarland, Paul Halbert and Charles Ice. Capacity of the line is 90,000 to 100,000 bbl. daily.

Restricted Shipments Cut Mississippi Operations

Movements of crude oil through pipe lines to loading racks in the Eucutta, Wayne County, and Heidelberg, Jasper County, fields of Mississippi have been curtailed because of difficulty in procuring sufficient tank cars. Pipe-line allowables have been cut from 300 bbl. to 150 bbl. per well daily in order that oil may be moved through pipe-line facilities steadily at the rate practicable with the available supply of tank cars.

Crude oil from both fields is of asphalt base. That from Eucutta is 17° to 19° and from Heidelberg 21° to 22° A.P.I. gravity. Heating is required in treating the oil and it is reported that difficulties are encountered if pumping through the lines is stopped for extended periods.

Pipe-line facilities in both fields are operated by Oklahoma Pipe Line Co., which is to become part of Interstate Oil Pipe Line Co. An account of the consolidation of Oklahoma Pipe Line Co. and the pipeline system of Standard Oil Co. of Louisiana to form the new interstate firm, a subsidiary of Standard Oil Co. (New Jersey), is presented in the news section of this issue.

Gulf Takes Up Pipe Line Near Holdenville, Okla.

Gulf Refining Co., Tulsa pipe-line division, is engaged in digging up and reconditioning the 50-mile 8-in. crude-oil line from Little River to the Chambers pump station. The undertaking has been contracted by H. C. Price Co. which is having the work supervised by Charles Jones, spread superintendent, with headquarters at Holdenville, Okla., where a reconditioning yard is operated. As the job progresses the yard will be moved to Calvin, Stuart and Haywood, Okla.

The pipe being taken up is shipped to West Texas where a 63-mile 8-in. line is being laid for the Houston pipe-line division of Gulf Refining Co. for shipping sweet crude oil from the Keystone-Ellenburger and the Embar-Ellenburger pools.

Shell Reconditions Line From Cushing to Tonkawa

Shell Pipe Line Corp. is engaged in reconditioning two parallel 52-mile 6-in. crude-oil lines between Cushing and Tonkawa, Okla. The contractor, Smith Contracting Co.,

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Front view of Holan 2-ton Winch

The Latest Development In Compact, Easily Operated Winches — Tops In Quality

Small and compact, this winch is exceptionally easy to operate and very efficient. Two speed ratios permit handling heavy loads at slow speeds and light loads at high speeds. Perfect control is assured for raising load. When lowering load, control is secured by a single shoe hand brake that has sufficient capacity to hold full load. Full rated load is 4000 lbs., but each winch is tested at factory by applying a load of approximately 6000 lbs.

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is preparing to move the field office for the project from Perry to Stillwater, Okla.

Tennessee Gas Seeks to Connect More Reserves

WASHINGTON.—At least 76,500,000 cu. ft. of natural gas which is now being wasted daily in Texas, or which is without a market, will be conserved and utilized under proposals filed with the Federal Power Commission by Tennessee Gas & Transmission Co.

Gardiner Symonds, president of the Tennessee company, petitioned the FPC for permission to connect the line with 11 Texas oil and gas fields now having no outlet, and stated that the maximum daily take may run as high as 151,000,000 cu. ft. a day. The company has asked for an early hearing, but no date has yet been set.

This gas would augment the reserves of Chicago Corp., which is now supplying all the needs of the recently completed Texas-West Virginia line.

Officials of Tennessee estimate that in a 10-mile band on each side of their line in Texas, more than 200,000,000 cu. ft. of natural gas is being legally wasted every 24 hours in the production of crude oil.

Under the proposals filed by Tennessee Gas, a minimum of 42,000,000 and a maximum of 72,000,000 cu. ft. of these petroleum vapors would be recovered every day and put to economic use. The gas would be commingled with the company's present supplies being transmitted to the Appalachian area. In addition, Chicago Corp. is installing facilities at its Wardner plant to gather and deliver 12,000,000 cu. ft. daily for pipe-line use.

Tennessee Gas proposes to make connections with gas fields and vented gas in the following counties: San Patricio, Nueces, Jim Wells, Refugio, Aransas, Bee, Goliad, Victoria, Calhoun, Jackson, Wharton, Matagorda and Colorado. Waste gas would be salvaged from operations in the following fields: Odem, Tom O'Connor, Refugio, Heyser and Placedo.

Fuel-Oil Barges Declared Adequate After Tryout

WASHINGTON. — Following almost a year's tryout, the Government owned wooden tank barges are pronounced adequate for the service in which they are employed. Lawrence T. Turner, head of Office of Defense Transportation's waterways transport department, said 84 of these barges, working with 21 tugboats, are now in service on the Gulf Intercoastal Canal, transporting Navy special fuel oil eastward from Texas refineries. Allocated to, and operated by, private towing companies, they will remain in that service as long as required.

"The wartime shortage of steel was responsible for the emergency introduction of these wooden tank barges," Turner said. "They were first used on the Gulf Intracoastal Canal in September 1943. Those early movements, however, indicated the need of some modification to render the barges adequate. Leaks through the seams resulted in an emulsion of salt water and oil inside the barges.

"After modifying the barges, last fall and winter, by lengthening the stripping pipes and adding new waterproofing to the decks, along with other improvements, service was resumed in February 1944 and has continued ever since."

Turner explained that the barges are nearly 200 ft. long and will carry 5,200 bbl. of residual oil. They operate in units of 4 barges pulled by one tugboat. In addition to those in use on the canal, it was said, there are about 100 wooden tank barges in the service of the Army, mainly in lighterage work.

ODT last week allocated 22 new steel tank barges to private towing companies. The barges, to transport oil and other liquid cargoes, will be delivered in December and January.

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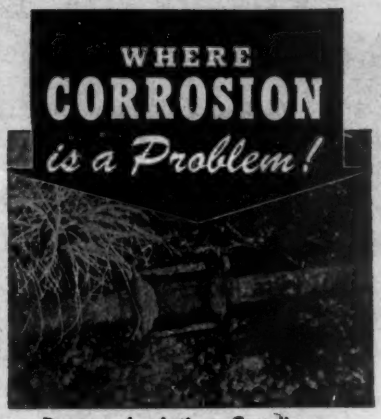

Dresser Insulating Couplings break the flow of current between pipe lengths, prevent hot spots and electrolytic corrosion on the gathering line shown in the above photo.

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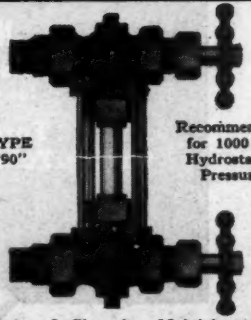

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Exploration and Drilling

Week's Highlights

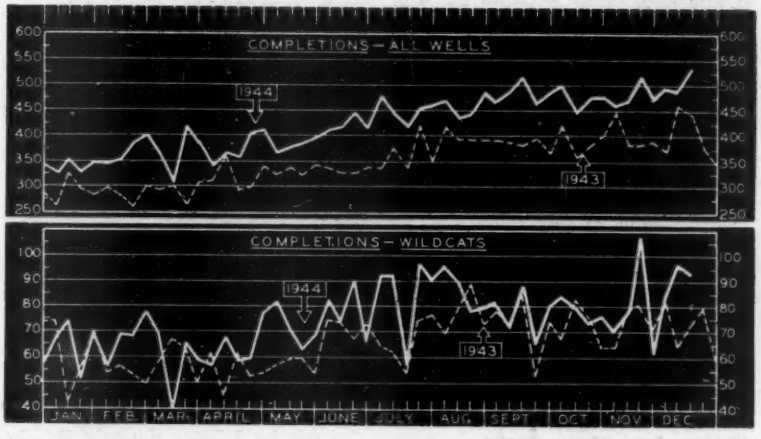
CANADA is in the spotlight this week with a wildcat that looks like the potential second Turner Valley, for which operators have been searching in the Alberta foothills for years. Shell Oil Co. 4-24-J, on the Jumping Pound structure, 20 miles west of Calgary, and about 25 miles north and west of the north end of the Turner Valley field, is performing very much like the discovery well at Turner Valley did in October 1924.

The Jumping Pound test found the top of the Madison at 9,618 ft., or datum of —5,598 ft., and has been drilled 329 ft. in the lime to 9,947 ft.

The excitement is the result of a drill-stem test in the porous lime zone. Porous streaks were found at 9,727-46 ft., followed by 101 ft. of porous formation at 9,746-9,847 ft. After setting 7-in. casing at 9,636 ft., a drill-stem test was made of the 120-ft. zone 9,727-9,847 ft. In 3 hours the well flowed about 800,000 cu. ft. of wet gas through a 3/8-in. bottomhole choke, and built up a bottomhole flowing pressure of 1,700 lb. When the pipe was pulled, it was found to contain over 100 ft. of 60° gravity condensate with no water. The volume of condensate produced with the wet gas was not measured, but was estimated to be fairly substantial.

The Shell test is on the crest of a long anticline that lies north and east of the Madison lime fault block from which Turner Valley produces. The crest at Turner Valley was a gas and condensate cap, which was developed early. Development of oil on the west flank followed with the east flank cut off by faulting. The Jumping Pound anticline does not appear to have either flank cut by major faulting for considerable distances from the crest.

At —5,598 ft., the Madison in the Jumping Pound test is 1,500 to 2,000 ft. lower than the oil-water contact on the Turner Valley west flank, and compares with a +525 ft., Madison top in the Turner Valley discovery well. In the "east side" lime block of Turner Valley, Northend Petroleum Co. 1, now Canada's deepest producer with total depth of 9,612 ft., had the base of the lower porous zone of the Madison at —5,602 ft.



Solid line charts current weekly completions, service wells in Eastern area not included

COMPLETIONS IN ALL FIELDS . . .

Week ended December 16, 1944

	Oil	Gas	Dry	Total	Footage	Total Comp. to date 1944	1943
N. Y., Penna., W. Va.	65	24	*63	152	194,650	6,113	3,342
Ohio	8	12	6	26	57,079	986	917
Indiana	2	0	2	4	7,831	242	216
Kentucky	3	0	10	13	26,133	736	466
Illinois	33	1	19	53	146,207	1,905	1,744
Michigan	4	1	14	19	46,168	658	613
Kansas	7	11	22	40	130,402	1,778	1,642
Nebraska, Missouri, Iowa	0	1	1	2	1,762	41	46
Oklahoma	36	2	14	52	243,181	1,794	1,161
Texas:							
North Central	13	0	16	29	81,577	1,442	1,448
West	29	0	4	33	176,406	1,537	900
Panhandle	5	6	1	12	37,286	297	178
Eastern	3	3	1	7	46,870	313	308
Gulf Coast	17	3	7	27	195,003	1,235	460
Southwest	6	1	3	10	39,582	651	914
Total Texas	73	13	32	118	576,724	5,475	4,208
Louisiana:							
Northern	2	3	2	7	31,006	314	332
Southern	7	0	4	11	100,587	474	349
Total Louisiana	9	3	6	18	131,593	788	681
Arkansas	5	0	3	8	39,184	207	269
Mississippi	1	0	2	3	17,815	154	104
Southeastern States	0	0	1	1	5,396	51	(†)
Montana	5	2	3	10	26,080	341	229
Wyoming	7	0	0	7	29,130	176	132
Colorado-Utah	1	0	1	2	8,180	35	30
New Mexico	8	0	2	10	36,593	388	237
California	43	3	9	55	204,322	1,939	1,346
Total United States	310	73	210	593	1,928,430	23,807	17,383
Total previous week	301	44	204	549			
Total Dec. 18, 1943	247	54	138	439			

*Includes 58 service wells. †Included in total for Mississippi.

TEXAS GULF COAST

Harris County Prospective Discovery to Receive Test

HOUSTON.—The Texas Co. is preparing to run a production test at its 1 Mrs. Madge Hopkins, prospective discovery, 3 miles northeast of Addicks, in Harris County. The well has been drilled to total depth of 8,014 ft., with 5½-in. casing set at 7,760 ft. A 4-hour drill-stem test with ¼-in. chokes top and bottom, and perforations at 7,702-06 ft. showed 250 lb. working pressure and yielded 1,800 ft. of oil and 150 ft. of wash water, with no salt water. Gravity is said to be around 41°.

Sun Oil Co. 1 Rosa Arens, in the North Winnie field, Chambers County, is shut in after testing in 200 perforations at 9,840-90 ft. Open flow is estimated at 48,000,000 cu. ft. gas a day with white condensate of 52.3° gravity. Tubing pressure showed 3,745 lb. on ½-in. choke and 3,400 lb. on ¾-in. choke. Shut-in tubing pressure was 3,750 lb., casing pressure 700 lb. This is a deeper sand than has yet been produced in that area. The 1 Daughery "Pool," discovery well, was completed as a 36.3°-degree gravity oil well in perforations at 8,757-59 ft. and the 1 Evans was completed as a condensate producer in perforations at 9,434-51 ft.

Sun's 14 D. H. Braman, new producer in the North Markham field, Matagorda County, is flowing 267 bbl. a day on 10/64-in. choke from perforations at 7,705-20 ft. Tubing pressure is 1,050 lb., gravity 34.8°, gas-oil ratio 561. Total depth is 8,102 ft., with 5½-in. casing set at 8,100 ft.

Humble Oil & Refining Co. 33-A State-Galveston Bay, at Redfish Reef, Chambers County, has been shut in as a gas well. On preliminary test it made 1.21 bbl. of condensate an hour on ½-in. choke, with gas-oil ratio 44,110, tubing pressure 2,700 lb., gravity 51.9°. Top of cement is at 10,983 ft. with perforations above.

Shell Oil Co., Inc. 2 H. J. Pratt, new Wilcox producer in the Livingston field, Polk County, flowed on a potential test 679.68 bbl. a day through ¼-in. choke from perforations at 7,020-30 ft., with gas-oil ratio 527, gravity 37°. Total depth is 7,038 ft. and top of Wilcox 7,030 ft. with 5½-in. casing set on bottom and 2-in. tubing at 6,967 ft.

UPPER GULF COAST WILDCAT COMPLETIONS

Wharton County: Crown Central Petroleum Corp. 1 Stovall et al, 8 mi. SW of Danevang, Day Land & Cattle Co. Sur., dry at 7,525 ft.

John G. Mayo and Superior Drilling Co. 1 W. C. Hodges, 1 mi. E of Wharton, R. Jones Sur., dry at 6,270 ft.

SOUTH LOUISIANA

Plumb Bob Test Starts Off Flowing 240 Bbl. a Day

NEW ORLEANS.—The Texas Co. 1 St. Martin Parish School Board, in 16-8s-7e, Plumb Bob area of St. Martin Parish, was completed flowing 240 bbl. of pipe-line oil a day through 9/64-in. choke, from perforations at 8,480-8,502 ft. Tubing pressure was 1,275 lb., gravity 30.2°, gas-oil ratio 760. Total depth is 9,747 ft., with 7-in. casing set at 9,070 ft., screen and liner cemented in the hole, and 2½-in. at 8,402 ft.

Barnsdall Oil Co. is installing a blow-out preventer and preparing to drill plug and test the 2 Minos Miller, in 38-7s-3w, east offset to the discovery well in the West Tepetate (Panchoville) field. Total depth is 9,407 ft., with 7-in. casing set at 9,220 ft. A drill-stem test at 8,380-8,400 ft. recovered 36.4-gravity pipe-line oil, with bottom-hole flowing pressure 3,750 lb. The company's 2 J. Fuselier, in 38-7s-3w, northeast offset to the discovery well, is drilling below 8,290 ft., and preparing to run electric log.

Sun Oil Co. continues to test the 1 Sensat pool, on the northeast side of the Egan field in Acadia Parish. The last gage in perforations at 10,770-785 ft. showed a flow of 214 bbl. a day on ½-in. choke, with tubing pressure 1,400 lb., and averaging about 6 per cent cut. Total depth is 10,795 ft., with 7-in. casing set on bottom.

William Helis 2 Dearing Community, in 65-7s-1w, in the University field, East Baton Rouge Parish, flowed 162 bbl. a day on completion through perforations at 9,545-52 ft., on ½-in. choke. Gas-oil ratio was 1,270, tubing pressure 980 lb., casing pressure 220 lb. and gravity 40.4°.

DAILY AVERAGE PRODUCTION FOR WEEK

	Dec. 16 crude oil	Distillate, allied products	December PAW quota all oils	Dec. 9 crude oil
Arkansas	81,050	5,100	83,100	80,700
California	885,250	52,000	937,000	880,250
Colorado	7,800	.....	9,500	7,700
Eastern	63,000	3,800	78,200	68,000
Illinois	196,400	12,300	212,300	203,400
Indiana	11,400	.....	13,000	13,600
Kansas	267,100	6,000	280,000	267,400
Kentucky	29,300	2,800	32,800	29,700
Louisiana	361,400	35,300	385,300	360,750
North Louisiana	71,800	.....	.....	71,150
South Louisiana	289,600	.....	.....	289,600
Michigan	52,700	500	47,500	52,900
Mississippi	52,100	.....	53,000	48,050
Montana	23,570	400	23,400	23,550
Nebraska	1,050	.....	1,200	1,050
New Mexico	104,750	5,600	111,600	104,700
Oklahoma	358,200	27,000	377,000	360,400
Texas	2,111,550	145,000	2,278,000	2,111,550
East Texas	371,100	.....	.....	371,000
East Central Texas	141,500	.....	.....	141,450
North Central Texas	140,500	.....	.....	140,600
Texas Panhandle	88,700	.....	.....	88,750
West Texas	471,300	.....	.....	471,350
South Central (S.A.)	20,100	.....	.....	20,050
South Texas (Lerado)	79,050	.....	.....	79,000
Lower Gulf Coast	246,450	.....	.....	246,400
Upper Gulf Coast	552,850	.....	.....	552,950
Wyoming	93,410	3,500	103,500	91,750
Total United States	4,700,030	304,300	5,026,400	4,705,450
Change from previous week	down 5,420			

Total production January 1-December 16, 1944 ..... 1,602,076,360 bbl.
Same period last year ..... 1,436,723,725 bbl.

ROCKY MOUNTAIN

Garland Flank Test Adds To Tensleep Pay Thickness

DENVER.—A semiwildcat on the southeastern flank of the Garland field, Big Horn County, Wyoming, in The Texas Co. 2 Griffin Tract 8 Lot 60-55n-97w, is drilling in the Tensleep and showing some saturation in the top. Top of the Tensleep is at 4,444 ft., about 150 ft. lower than in the lowest Tensleep producer. A drill-stem test at 4,461-91 ft., open 1 hour, showed 770 ft. of pipe-line oil and 75 ft. of oil-cut mud, equal to 17 bbl. per hour fillup. So far no water has been encountered and drilling is proceeding cautiously.

Good producer at Fourbear.—Fifteen years after the discovery well was completed, the Honolulu Oil Co. has brought in a good producer in the Tensleep sand on the Fourbear structure, Park County, Wyoming, in its 3 Unit, SW NW SE 20-48n-103w. It had the top of the Tensleep at 2,875 ft., at which depth the 7-in. was set, and was drilled to 3,060 ft. On a pumping test it made 400 bbl. per day of 13.5-gravity oil.

Fort Collins wildcat shows saturation.—Fort Collins Producing Corp. 1 Community well, C SW NE 18-8n-68w, ¾ mile north of nearest producer in the old Fort Collins field, topped the Muddy sand at 4,724 ft. and at 4,750 ft., total depth, recovered 24 ft. of saturated core with sand showing considerable porosity. Casing is being run to make a test and indications are favorable for at least a small well.

Keith prospect shows gas.—Texas Co. 1 Cicon, NE NW SW 29-36n-6e, a wildcat on the Keith prospect, Liberty County, Montana, showed for 6,000,000 cu. ft. of sweet gas in a drill-stem test at 2,875½-2,913 ft. Another test at 2,938-90 ft. showed 517,000 cu. ft. of sulfur gas with a shutin pressure of 1,080 lbs. Top of the Ellis sand was at 2,726 ft.

Big Sand Draw still in sand.—Sinclair-Wyoming Oil Co. 1 Unit, SW NW NW 14-32n-95w, Big Sand Draw field, Fremont County, Wyoming, is still coring Tensleep and continuing to show good saturation. Last core was at 7,583-88 ft., total depth. 303 ft. below the top of the sand.

COLORADO WILDCAT COMPLETION

Archuleta County, Boone: L. R. Travis 1 Davis, SW SW NE 18-33n-1e, TD 2,225 ft., water in Dakota, dry.

WYOMING WILDCAT COMPLETIONS

Fremont County, Steamboat Butte: British-American 4-E Tribal, NE SE NW 5-3n-1w, TD 5,173 ft., 5½-in. 5,173 ft., top Lakota 4,495 ft., 450 bbl. per day from Lakota through perf., Lakota sand discovery.

Park County, Fourbear: Honolulu Oil 3 Unit, SW NW SE 20-48n-103w, TD 3,060 ft., 7-in. 2,875 ft., top Tensleep 2,875 ft., 400 bbl. in 24 hours on pump.

MONTANA WILDCAT COMPLETIONS

Liberty County, Marias: Texas 1 State, NE SE SW 36-29n-6e, TD 2,573 ft., Sunburst 2,215-25 ft., Ellis-Madison 2,553 ft., dry.

Pondera County, Midway: Hageman & Pond 1 Speer, NE SE SW 17-28n-1w, TD 1,730 ft., water in Sunburst at 1,680-95 ft., dry.

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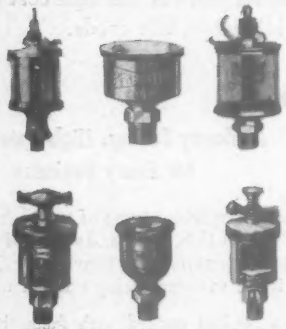

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N. CENTRAL TEXAS

Ohio's Discovery Is Shut In for Potential Test

WICHITA FALLS.—Ohio Oil Co. 1 W. R. Ross, new Strawn lime discovery in eastern King County, flowed 304 bbl. of oil in 4 hours through ½-in. choke on 2-in. tubing, with gas-oil ratio 800-1. Oil is about 36 gravity. The well is shut in for potential test. Production is from lime at 5,236-57 ft., total depth. Rig is being moved 1,400 ft. east to the company's location for 2 Ross. The second hole may be drilled deeper than the discovery, which was to have gone to 6,800 ft. but stopped when it encountered the prolific lime pay zone.

Anderson-Prichard Corp. 1 R. O. Wood "A," Clay County wildcat in Section 12, MEP&P Ry. Co. Survey A-339, northwest of Henrietta, was bottomed at 6,672 ft. in dry Ellenburger, casing was perforated at 5,935-50 ft. opposite the Caddo conglomerate and the well swabbed in and flowed 84 bbl. oil in 8 hours with casing pressure of 90 lb., to assure opening of a new field. The Texas Co. 1 Leola Hapgood, wildcat 6 miles northwest of Bellevue, showed 215 ft. of salty mud with slight show of gas on a 14-minute drill-stem test at 6,346-69 ft., in streaks of conglomerate with oil stains. It drilled ahead below 6,472 ft.

At Sivels Bend, in northern Cooke County, Texas 1 Beasley, just southwest of the same operator's 1 Rasure discovery pumper, was drilling at 6,820 ft. in dry sand. It is reported checking higher than the discovery, but missed the 6,750-ft. pay sand. In northeastern Archer County, Phillips Petroleum Co. 1 Bullington was drilling below 7,875 ft. in dolomite with streaks of tight sand.

NORTH CENTRAL TEXAS WILDCAT COMPLETIONS

Archer County: D. H. Bolin 1 C. L. Abercrombie "I", Blk. 104, J. W. Harris subd. of Club Ranch, 2 mi. W and 1 mi. S Archer City, dry, TD 1,326 ft.

Bridwell Oil Co. 2 V. F. Veitenheimer, Lot 60, Blk. 4, Clark & Plumb Sur., 3 mi. S and 6 mi. E Archer City, elev. 1,008 ft., dry, TD 1,043 ft.

The Texas Co. 1 Henry Harrison, Sec. 1846, TE&L Sur., 9 mi. E and 1 mi. N Anarene, elev. 1,165 ft., Caddo 4,888 ft., Ellenburger 5,761 ft., dry, TD 6,043 ft.

Cooke County: The Texas Co. 1 W. B. Rasure, J. Massingill Sur. A-687, 2 mi. N Sivell's Bend, IP 139 bbl. day, perf. from 6,760-68 Strawn sand, TD 7,518 ft.

Montague County: S. Y. Dorfman et al 1 J. J. Berry est. et al, W. J. Wells Sur. A-844, 2 mi. W and ¾ mi. N Nocona, elev. 985 ft., flowed 728 bbl. day through 2-in. tubing, TD 5,351 ft.

Wichita County: The Texas Co. 15 Fred Thom, W. H. Spillers Sur. A-257, 6 mi. N and 2 mi. E Kamay, elev. 1,041 ft., pumped 184 bbl. day, TD 1,805 ft.

Johnny N. Fidel 1 Shelby est., Sec. 46, Blk. 13, H&TC Sur., ½ mi. W Harrold, elev. 1,224 ft., dry, TD 5,403 ft.

WEST CENTRAL TEXAS WILDCAT COMPLETIONS

Jones County: Merry Bros. & Perini and Alder Oil Co. 1 T. J. Barrett, Sec. 18, Blk. 2, SPRR Sur., 3 mi. N Truby, elev. 1,732 ft., Hope 2,547 ft., dry, TD 2,567 ft.

Palo Pinto County: J. E. Matthews et al 1 J. F. Berger, Sec. 54, Blk. 2, T&P RR Sur., 7 mi. SW Palo Pinto, dry, TD 1,375 ft.

Shackelford County: Roeser & Pendleton, Inc. 1 J. Morris Cottle, Sec. 23, Baylor Orphan Asylum land, 4 mi. E Sedwick, elev. 1,352 ft., Ellenburger 4,326 ft., dry, TD 4,351 ft.

Taylor County: Great Lake Carbon Corp. 1 W. E. Jones, W. M. Bishop Sur. No. 43, 4 mi. SW Abilene, elev. 1,775 ft., top pay 2,005 ft. Flippen, pumped 50 bbl. day through 2-in. tubing, TD 2,508 ft.

SOUTHWEST TEXAS

Test of Seaboard Wildcat Recovers Faint Oil Show

CORPUS CHRISTI.—Seaboard Oil Co. of Delaware 1 Sallye Treadwell, wildcat 2 miles southeast of Coy City, in the Henry S. Brown Survey, Karnes County, is coring sand at 4,835 ft. after recovering on a 15-minute drill-stem test at 4,760-70 ft., 4,000 ft. of fresh water, with slight oil show. It recovered 90 ft. of mud and 180 ft. of fresh water on a drill-stem test at 4,800-05 ft. in 15 minutes.

Dulup Oil Co. 12-A Puig, in the Dulup field, Webb County, gaged on potential test 40 bbl. a day, on pump, from open hole 1,824-28 ft. Total depth is 1,828 ft., with 7-in. oil string set at 1,817 ft.

Humble Oil & Refining Co. 2 Chas. M. Armstrong, wildcat 1¼ miles east of Armstrong, in the La Berreta grant, Kenedy County, is drilling at 10,625 ft. in shale. Humble's 1 Juana Y. McDermott, wildcat in the Sernardo Gutierrez Porcion 14, 25 miles north of Roma, in Zapata County, is drilling at 6,587 ft. in hard shale.

SOUTHWEST TEXAS WILDCAT COMPLETIONS

Refugio County: Hewit & Dougherty 1 K. D. Roche, Thos. O'Connor Sur., 7 mi. SW of Woodsboro, dry at 6,791 ft.

Starr County: W. W. Zimmerman 1 Mary Hedley Edgerton Sur. 66, 10 mi. N of Rio Grande City, dry at 1,257 ft.

Webb County: Dulup Oil Co. 4 Bruni, Albercas grant, 12 mi. S of Mirando City, dry at 2,358 ft.

APPALACHIAN FIELD

Heavy Snowfall Interferes With Oil-Field Operations

PITTSBURGH.—A record fall of snow in the Appalachian area has made main highways impassible, seriously retarding both pumping of wells and pipe line runs from stock tanks. It is estimated that losses caused by the storm may equal 5 or 6 days' production. As sales to refineries are based on current production, stocks long since having been exhausted, refiners have been advised to reduce their charging rate of Pennsylvania grade crude to a minimum to avoid complete shutdown in freezing weather.

In southwest Pennsylvania the east flank wildcat of New Penn Development Co. et al on the J. P. Thompson tract in Wharton Township, Fayette County, topped the Onondaga lime at 7,464 ft. and the chert at 7,491 ft. The test is 50 ft. in the chert, with no showing of gas.

In Washington district, Calhoun County, West Virginia, Hope Natural Gas Co. completed a fair gas well, 6922 Bennett-Stalnaker, gaging 1,400,000 cu. ft. from the Salt sand at total depth 1,590 ft.

In Gilmer County, Verle Stewart completed a test on O. C. Godfrey farm in the DeKalb district, which gages 1,500,000 cu. ft. from the Salt sand at 1,265 ft.

In Kanawha County, Cumberland Gas Co. is testing 7 Raymond City C. & T. Co. in the Union district after acidizing the Big Lime 1,714-1,820 ft. and a subsequent gage of 671,000 cu. ft. of gas.

In Wyoming County, Godfrey L. Cabot,

WHEN BOWSER EQUIPMENT WENT TO WORK,

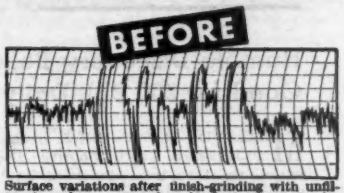
Regrinds Dropped from 25% to ½%

Precision gages, such as those made by Standard Gage Company, Inc., of Poughkeepsie, N. Y., and required by thousands of manufacturers in scores of industries, have tolerances as small as .00001 inch.

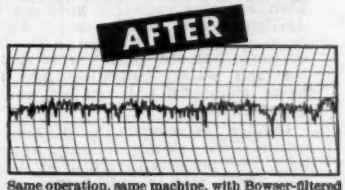
Standard Gage, in its grinding operations, works to .0001, after which the gages are lapped to the final tolerance. Abrasions, due largely to particles in the unfiltered coolant, were causing regrinds averaging 25%.

Bowser Pressure Filters were installed ... and *regrinds dropped to less than 5/10 of 1%!* Picture that in terms of savings in time, labor and money!

The petroleum industry has seen some of the most remarkable examples of saving through use of Bowser equipment. In one instance, $6,000 worth of Bowser Bassler Meters were installed in a southern field, permitting the salvaging of $80,000 worth of tanks and other equipment that cost $1,000 a month to maintain. Thus the savings in maintenance alone paid for the meters in the first six months. Besides this, there was the salvage value of the old equipment, running into many thousands of dollars. A Bowser engineer will gladly consult with you about your specific problem. Write today. BOWSER, INC., Fort Wayne 5, Indiana.



Surface variations after finish-grinding with unfiltered coolant prepared only 2 days previously. Scratches, scarcely visible, caused regrinding.



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ROBINSON · ILLINOIS

Inc. completed 1155 Pocahontas Land Co. in the Slab Fork district with a gage of 959,000 cu. ft. of gas, after shooting the Ravenscliff sand at 1,552-83 ft., with total depth 1,607 ft. In the Center district, United Producing Co. 1203 W. M. Ritter Lumber Co. gages 446,000 cu. ft. of gas, natural, with the Maxton sand at 1,920 ft., Big Lime 2,133-679 ft., Berea 3,262-302 ft., and total depth 3,326 ft.

PERMIAN BASIN

Humble Discovery Believed Good for 200 Bbl. Daily

MIDLAND.—Humble Oil & Refining Co. 1 Jackson, Lamb County discovery, which went to total depth of 7,191 ft. in granite then plugged back to complete in broken lime pay at 5,320-6,050 ft., has been pumping regularly but only during daylight hours, for the past 7 days, and in approximately 10 hours each day has averaged 100 bbl. of oil with 21 bbl. of b.s. and water, indicating that it will make about 200 bbl. net oil when produced steadily.

Phillips Petroleum Co. 1 Ada Price, central Pecos County wildcat, which once held the deep-well record at 15,279 ft. and which was in hole trouble for several months, has conditioned the hole and is testing for deep production. With a 5½-in. string cemented at 11,660 ft., it drilled out to 11,660 ft., then perforated with 170 shots at 11,495-525 ft., displaced mud with water and swabbed down to 5,000 ft. from the top. Shut in for 12 hours the fluid level did not rise, and swabbing was resumed.

In Ector County, Shell Oil Co., Inc. and Cities Service Oil Co. 1 TXL has squeezed off perforations at 8,120-50 ft. after showing only a little oil and will perforate higher in the section. The Texas Co. 1 Fraser (TXL), wildcat 4 miles south of Shell-Cities Service 1 TXL and 3 miles east of the Wheeler pool, made a 4-hour drill-stem test at 7,711-7,914 ft. The packer leaked after 4 hours and recovery was 4,000 ft. of gas-cut mud and about ½ bbl. of free oil. Further testing was planned.

The Texas Co. 1 Gorman, Tom Green County wildcat, in Section 85, Block 11, SPRR Survey, plugged back from total depth 5,504 ft. in lime, cemented 5½-in. casing at 4,910 ft. and will test the Strawn sand around 4,950-5,000 ft. Samples showed oil, but a drill-stem test at 4,950-5,030 ft. showed only 40 ft. of drilling fluid, with no shows of oil or gas.

WEST TEXAS WILDCAT COMPLETIONS

Gaines County: Humble Oil & Refg. Co. 1 M. S. Doss, Sec. 9, Blk. A-24, PSL, 7 mi. SW Seminole, elev. 3,343 ft., top pay 7,030 ft. Clear Fork, flowed 210 bbl. day through ¼-in. choke on tubing, gas-oil ratio 517 to 1, gravity 33.6, TD 9,949 ft.

Lamb County: Woodley Petroleum Co. 1 W. E. Bird, Sec. 66, Blk. T, T. A. Thompson Sur., 5½ mi. NW Humble, 1 Jackson, elev. 3,555 ft., San Angelo 4,510 ft., Clear Fork 5,170 ft., Tubb 5,765 ft., dry, TD 7,265 ft.

Pecos County: Humble Oil & Refg. Co. 1 State National Bank of El Paso, Sec. 7, Blk. 140, T&STL Sur., elev. 2,604 ft., Ellenburger 8,240 ft., dry, TD 8,440 ft.

SOUTHEASTERN NEW MEXICO

HOBBS.—Barney Cockburn 1 Wyatt-State, cable-tool wildcat in 33-17-33, in western Lea County, 1½ miles southeast of Maljamar field production, is standing at total depth of 7,025 ft. and preparing to run a string of 5½-in. pipe. The hole is full of fluid, some oil, but the exact source of the oil is unknown. The 7-in. casing string is set at 4,150 ft., just below the regular Maljamar 4,000-ft. pay zone. Drilled "tight", this wildcat is reported to have encountered several good oil shows between 4,650 ft. and the present total depth. One geological theory advanced is that it has found oil in the lower Permian lime, which might be the equivalent of lower Permian pays now being exploited in eastern Lea and adjacent West Texas counties, thus indicating that the zone might exist as a blanket oil-bearing horizon over a large area.

Continental Oil Co. 2-B-23 Skaggs, Monument area deep venture, recovered 10 bbl. of oil and 60 bbl. of water on its last 6-hour swabbing test before shutting down for repairs. Previously it swabbed 35 bbl. of oil and 280 bbl. of water in 22 hours. It is testing the Devonian lime section through perforations at 7,695-7,750 ft.

SOUTHEASTERN NEW MEXICO WILDCAT COMPLETIONS

Eddy County: Sanders Bros. 1 Holtman, 32-16s-26e, elev. 3,381 ft., dry, TD 6,761 ft.

Martin Yates, Jr., 1 Kaiser, 29-18s-27e, elev. 3,285 ft., top pay 1,350 ft., IP 20 bbl. day, TD 1,483 ft.

The Texas Co. 1 Riley, 15-20s-31e, elev. 3,458 ft., dry, TD 2,805 ft.

Lea County: Ralph Lowe 1 Humble-State, 36-25s-36e, Jal area, flowed 102 bbl. day natural, top pay 2,992 ft., TD 3,017 ft.

ILLINOIS

White County Outposts Start as Paying Producers

CENTRALIA, Ill.—W. I. Lewis 1 Burkhardt, SE NE SW 18-5s-9e, in White County, in a test of Cypress sand at 2,843-50 ft. showed for a 150-bbl. well on the pump. It had not been shot. The well is 4 miles from other production. Another important outpost in White County is Delta Drilling Co. and Sklar Oil Co. 1 T. E. Boltinghouse, NE NW NE 16-4s-14w, which was flowing 200 bbl. per day from Aux Vases sand at 2,831-55 ft. It extends the Calvin pool.

Thirty-three new wells were completed during the week with a total initial production of 3,789 bbl. Nineteen dry holes were abandoned.

ILLINOIS WILDCAT COMPLETIONS

Clinton County: Texas 1 B. P. Buehme, NW NE SW 22-3n-4w, dry at 1,181 ft. Glen Dean 674 ft., Cypress 845 ft., no Benoist, Aux Vases 1,004 ft., McClosky 1,136 ft., St. Louis 1,171 ft.

Crawford County: Ralph Willis 1 R. Fitzpatrick, SW SW NE 10-6n-11w, 500,000 cu. ft. of gas, TD 3,040 ft.

Edwards County: J. J. Lynn 2 Coad Sisters, C S½ SW SW 7-3s-11e, dry at 3,201 ft. Lower Kincaid 2,036 ft., Barlow 2,791 ft., Benoist 2,035 ft., Lower Renault 3,033 ft., Fredonia 3,165 ft.

Gallatin County: Sinclair-Wyoming 1 Ed Hines, SE SE NW 3-9s-10e, dry at 3,100 ft. Lower Kincaid 1,783 ft., Barlow 2,468 ft., Aux Vases 2,817 ft., Ste. Genevieve 2,830 ft.

Hamilton County: Swan & Jarvis 1 W. J. Hedges, NW NW NE 17-7s-5e, dry at 3,422 ft., Menard 2,329 ft., Cypress 2,886 ft., Aux Vases 3,196 ft., Fredonia 3,312 ft., McClosky 3,319 ft.

Jefferson County: Sinclair-Wyoming 1 E. Haines, NW SW NE 21-3s-4e, dry at 3,175 ft. Lower Kincaid 1,976 ft., Cypress 2,746 ft., Benoist 2,860 ft., Ste. Genevieve 3,000 ft.

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TULSA, OKLAHOMA

Lawrence County: Paul Greauling 1 T. W. Case, SE SE NW 36-2n-13w, Biehl sand 1,745-65 ft., shot, pumped 5 bbl. in 24 hours.

W. C. McBride, Inc. 1 H. Atkins, SE SE SW 1-3n-14w, dry at 3,160 ft. Glen Dean 2,548 ft., Cypress 2,802 ft., Benoist 2,936 ft., Aux Vases 2,954 ft., Fredonia 3,104 ft., McClosky 3,116 ft.

Sohio 1 V. Dick, NW SE SE 22-2n-12w, dry at 2,597 ft. Biehl sand 1,425 ft. had a showing of oil.

Marion County: H. Johnson et al 1 J. E. Hill, SE NE SE 30-3n-1e, dry at 1,605 ft. Glen Dean 1,260 ft., Cypress 1,458 ft., Benoist 1,540 ft., Benoist sand 1,551 ft.

Williamson County: Browning et al 1 Hayton, NW NW SE 32-9s-1e, dry at 2,060 ft. Barlow lime 1,650 ft., Cypress 1,675 ft., Benoist 1,875 ft., McClosky 2,033 ft.

KANSAS

Two Stafford County Tests Look Promising

TWO Stafford County wildcats are undergoing testing, and look as if they may be small producers. Harber Drilling Co. 1 Smith, SW SW SW 19-21-11w, about 1 mile west of the Snider South pool, swabbed 5 bbl. per hour from the Arbuckle after acidizing. Topeka was cut at 2,785 ft., Springer at 3,504 ft., and Arbuckle at 3,548 ft.

W. P. Faulkner 1 Hullman, NE NW NE 11-22-13w, just west of Drach pool, is acidizing after 200 ft. of oil rose in the hole in 12 hours, from the Arbuckle. Tops are Viola chert 3,657 ft., Springer 3,686 ft., and Arbuckle 3,738 ft.

Completions were poor this week, with 12 dry wildcats and 10 dry field tries. Only seven oil wells were completed, but 11 gas wells came in, 10 in Hugoton, and 1 in the Zenith Peace Creek pool. New locations indicate a continued slump, with only 23 new starts reported, including 8 wildcats. Graham and Russell counties have two wildcat locations each, and one each is scheduled for Cowley, Kingman, McPherson and Phillips counties.

KANSAS WILDCAT COMPLETIONS

Barton County: Maguire Industries 1 Logan, SE NW NW 35-16-14w, dry, TD 3,474 ft., Kansas City 3,185 ft., conglomerate 3,409 ft.

Ellis County: Sunray 1 Huber "C", NW NW SE 19-12-20w, dry, TD 3,969 ft., Arbuckle 3,958 ft.

McPherson County: William Ebke 1 Voth, NW NE NW 1-21-1w, dry, TD 3,028 ft., Mississippi lime 2,989 ft.

Nemaha County: F. D. Culpepper 1 Lamporter, W/2 SW SE 3-2-14e, dry, TD 2,900 ft., Hunton 2,830 ft.

Ness County: Texas 1 Boyd, SW SW SW 24-19-24w, dry, TD 4,960 ft., Arbuckle 4,795 ft.

Rice County: Conoco 1 Adams, SW NW NE 20-18-8w, dry, TD 3,515 ft., Arbuckle 3,446 ft.

Rooks County: Phil-Han 1 Vohs, SE SE NW 18-10-18w, dry, TD 3,760 ft., Arbuckle 3,725 ft.

Bridgeport 1 Atherton "A", NE NE NW 32-10-19w, dry, TD 3,482 ft., Arbuckle 3,809 ft.

Russell County: Kiowa Drilling 1 Washburn, NW NW SW 19-14-11w, dry, TD 3,232 ft., Arbuckle 3,179 ft.

Sedgwick County: Model & Roland 1 Gorges, NW SW NW 8-28-1w, dry, TD 3,678 ft., Viola 3,670 ft.

Stafford County: Vickers 1 Grub, SW SW SE 2-23-11w, dry, TD 3,777 ft., Arbuckle 3,725 ft.

Maguire Industries 1 Hartnett, NE NE NE 34-23-11w, dry, TD 3,923 ft., Arbuckle 3,873 ft.

OKLAHOMA

Tillman County Test Shows For New Pool Opener

GULF Oil Corp. 1 Copeland, N/2 NE NW 31-1s-18w, Tillman County, 7 miles north of the West Frederick pool and 6 miles east of the Tipton pool, is reported to have started flowing from perforations in the Arbuckle lime at 4,568-73 ft.

West Edmond.—Anderson-Prichard Oil Corp. 1 Collett, SE NW 25-15n-5w, extended the field northwest into Kingfisher County. This well has been feeling for the water-oil contact line in the Bois d'Arc, which was topped at 6,985 ft., and had the base at 7,045 ft. It was perforated with 40 shots at 7,030-40 ft., not acidized, and started flowing 15 bbl. of oil per hour with a slight trace of water, but fell off to 145 bbl. per day flow by heads with salinity of water increasing. The upper part of the Bois d'Arc will probably be perforated.

Reflecting the full effect of reduced well allowables, pipe-line runs averaged 41,700 bbl. daily from 283 connected wells, a decrease of 3,050 bbl. and an increase of 18 wells. Field totals showed 287 Hunton producers, 5 oil wells and 1 gas well in the Bartlesville sand.

Logan County.—Prospects of the Layton play along the east side of the Nemaha Ridge picked up when F. C. Hall 1 Perdue, SE SE SW 24-19n-4w, east of the Marshall pool, found 35 ft. of live green oil, no water and only a little mud, in a drill-stem test of the lower Layton at 4,863-73 ft.

OKLAHOMA WILDCAT COMPLETIONS

Cleveland County: Mid-Continent et al 1

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Brand, NE SE SW 26-10n-3w, flowed 750 bbl. from pay zone 7,742-72 ft., TD 9,219 ft., Bartlesville 7,740 ft., Woodford 7,903 ft., Hunton 8,032 ft.

Hughes County: Creekmore-Rooney 1 Fleet, NE NE SE 10-8n-10e, dry, TD 3,372 ft., Cromwell 3,330 ft.

Kiowa County: L. A. Helms 1 Burnett, SE NE SW 19-7n-20w, dry, TD 1,120 ft., granite wash 1,065 ft.

Logan County: Sinclair Prairie 1 Harp, NW SW SE 20-18n-2w, dry, TD 6,146 ft., second Wilcox 6,106 ft.

Texas 1 Le Grande, NE NE SW 26-15n-1w, dry, TD 5,855 ft., second Wilcox 5,835 ft.

Stephens County: Texas 1 Cooper, SW SW SW 16-2n-8w, OWWO, 43,000 cu. ft. gas from pay zone, 3,610-3,750 ft., sand, OTD 6,396 ft., PB 4,620 ft.

Skelly 1 Frensley "F", SW SE SW 24-1s-5w, new pay in Velma pool, pump and flow 30 bbl. in 2 hours from sand at 3,015-52 ft., TD 3,190 ft., gravity 30°.

Tillman County: Texas 1 Asenap, NW NW SW 25-4s-15w, dry, TD 4,196 ft., Arbuckle 4,150 ft.

Tulsa County: L. M. Evans 1 Switzer, SE NE NW 13-22n-12e, pumped 60 bbl. from pay zone 1,515-20 ft., TD 1,520 ft., Burgess 1,515 ft.

MICHIGAN

Dozen Dry Holes Dampen Wildcatting Enthusiasm

SAGINAW.—A dozen exploratory wells completed as dry holes dampened wildcatting enthusiasm in the past week. Some of the failures were of the deep-test variety.

Proration limits on Michigan oil fields will be reviewed at a hearing January 10, P. H. Hoffmaster, state supervisor of wells, announced in connection with an emergency order cutting by one-third, to 200 bbl. a day, the allowable daily withdrawal per well in the Deep River field of Arenac County. The director said the oil advisory board reported excessive bottom-hole pressure drop, making the production cut necessary for conservation of the pool.

Simultaneously, F. R. Frye, state petroleum engineer, reported Michigan refineries demand is exceeding the crude supply by 3,000 bbl. a day, a situation he expects to continue. Demand is running at 53,000 bbl. a day and December production is estimated at 49,275 bbl., or about 2,000 bbl. above the quota fixed by PAW.

The state conservation department issued 14 more drilling permits, lifting the 1944 total to 713. Two permits each were listed for Bay, Mecosta, Missaukee and Osceola counties, one each for Allegan, Arenac, Clinton, Isabella, Ogemaw and Roscommon.

MICHIGAN WILDCAT COMPLETIONS

Allegan County, Allegan Township: Charles W. Cook 1 Thomas, NE NE NW 20-2n-13w, dry in Traverse limestone at 1,345 ft.

Wayland Township: Raymond Donnersberger 1 Nick Krubee, SW SE NE 8-3n-11w, pumped 35 bbl., acidized, from Dundee, TD 1,801 ft.

Isabella County, Denver Township: Cities Service 1 Daniel H. Mater, NW NW SE 2-15n-3w, dry in Monroe at 3,738 ft.

Mecosta County, Big Rapids Township: W. C. Taggart 2 State-Consumers Power Co., C NE 14-15n-10w, dry at 1,151 ft.

Green Township: Sohio C-1 Consumers Power Co., C N½ SW SW 12-16n-10w, dry in Monroe at 3,815 ft.

Missaukee County, Riverside Township: Pure 1 William Dorland, C N½ SE NW 9-21n-7w, dry in Dundee at 4,065 ft.

Montcalm County, Bloomer Township: Rowmor Corp. 1 Linder-Rich, communitized, NW SW NW 33-9n-5w, dry in Alpena formation at 2,800 ft.

Pine Township: Sun 1 Theodore Martens, SE NW NW 36-11n-8w, dry at 1,186 ft.

Muskegon County, Holton Township: Muskegon Development Co. 1 Deo Johnson, SW SW SW 3-12n-15w, dry in Traverse limestone at 2,012 ft.

Ogemaw County, Logan Township: Sun 1 McKay, communitized, C NW 20-22n-4e, dry in Berea at 1,520 ft.

Oceana County, Leavitt Township: Sinclair-Wyoming 1 Thad Vaughn, NW NW SE 7-15n-15w, dry at 3,400 ft.

Roscommon County, Higgins Township: Sun A-1 State-Higgins, S SE NE 23-24n-2w, dry at 4,379 ft.

Wexford County, Clam Lake Township: Charles W. Teater and Americrude Oil Co. 1 Wexford County Road Commission, NE SE NW 10-21n-9w, dry at 4,041 ft.

EASTERN TEXAS

Angelina County Wildcat to Receive a Second Test

DALLAS.—Humble Oil & Refining Co. 1 Angelina County Lumber Co., projected 10,000-ft. wildcat in northwestern Angelina County, W. H. Herring Survey, topped the Woodbine at about 6,960 ft., made a drill-stem test at 6,943-77 ft., using ¼-in. chokes, and recovered 300 ft. of mud, 270 ft. of drilling mud and 90

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ft. of mud and salt water. Operators thought the pipe was leaking, however, and prepared to test again. As this wildcat is 25 miles east and south of the nearest Woodbine sand production, its show of gas in the top of the Woodbine created interest.

Just south of Mount Pleasant, in Titus County, Humble's 1 Searcy recovered 4 ft. of shale and no shows in coring at 10,504-13 ft. It drilled ahead below 10,520 ft., probably is near the top of the Smackover.

Van Zandt County.—Magnolia Petroleum Co. 1 Phillips, north offset to the pumping discovery well in the Fruitvale field, perforated pipe at 8,594-8,626 ft., used 500 gal. of mud acid, then swabbed out a 15-bbl. oil load and 28 bbl. of new oil in 6 hours. Then it was shut down to install pumping unit. A new Travis Peak pool for the county is being established at Humble's 1 Bruce, 4 miles south of Edgewood, which will be completed as a pumper. After perforating pipe at 8,524-44 ft. it swabbed and flowed 6 to 8 bbl. an hour of 35-gravity oil with no water. Although the hole was filled to the surface, the well would not flow without agitation. Appearance of salt water dimmed prospects for a good well at The Texas Co. 1 Stout, on the Tundra prospect. It started off flowing 32 bbl. of 44-gravity oil in 6 hours through 9/64-in. choke, but on a subsequent gage made 33 bbl. fluid in 24 hours with 5 per cent salt water. It is producing from the lower Rodessa pay at 8,150-60 ft.

A 12,000-ft. Travis Peak wildcat in the Buffalo area of Leon County will be drilled jointly by Shell Oil Co., Inc. and Lone Star Producing Co. at 1 Mrs. L. B. Flack, approximately ½ mile north of the south corner of W. Martin Survey. The second deep test drilled in the Long Lake field, Anderson County, Tide Water-Seaboard 4 Evans, is past 10,640 ft. with no worthwhile shows encountered.

EAST TEXAS WILDCAT COMPLETION

Bowie County: J. K. Hughes Oil Co. et al 1 J. R. Howard, J. H. Dyer Sur., 5 mi. N DeKalb, elev. 371 ft., dry, TD 4,590 ft.

CALIFORNIA

Tehama County Completion Is Listed as Discovery

LOS ANGELES.—California's latest gas field, which will probably be called Corning, as it is close to the town of that name in Tehama County, has been officially listed as a discovery by Superior Oil Co. The well, 1 Saldubehere, in 12-24n-3w, was completed in a gas zone reported to be at 1,070-1,504 ft. from which it flowed at a daily rate of 17,675,000 cu. ft. of gas.

This well was carried to 9,225 ft, and a string of 8⅝-in. casing cemented at 4,071 ft., following which 818 ft. of 5½-in. blank liner was cemented at 4,796 ft. The liner was gun-perforated at 1,200-1,504 ft. and the well completed as a commercial gas well. What was found in the bottom of the hole, if anything, has not been revealed.

Superior is believed to have found an excellent gas field, substantially increasing the gas reserves in the north-central part of the state. It may be some time, however, before this and other northern gas fields are produced commercially, as they are not near transmission facilities and the Rio Vista field continues to produce enough gas to meet demands in the San Francisco bay region. Completion of dry gas fields in the central part of the state is of special interest in view of the projected pipe line from the Hugoton field in Texas to California.

Discovery of many gas fields in the area north of San Francisco may have an important bearing on the future status of the Stanpac gas line which was converted to crude oil service early in the war period. Whether it will ever be converted back to natural-gas service the future must tell.

In the Bakersfield Sewer Farm district, Western Gulf Oil Co. has taken its discovery well off production to undertake some corrective work. Production of this well has shown a rather high cut, supposedly caused by a defective water shutoff.

CALIFORNIA WILDCAT COMPLETIONS

Corning wildcat district, Tehama County: Superior 1 Saldubehree, 12-24n-3w, flowed 17,676,000 cu. ft. gas, no oil, two 64/64-in. beans, pressures 380/485 lb., shut-in pressure 650/545 lb., dual completion through tubing and casing, TD 9,225 ft., PB 4,934 ft., 8⅝-in. casing cemented 4,071 ft., 818 ft. 5½-in. liner cemented 4,796 ft., perf. 1,200-1,300 ft., discovery well in new gas field.

Cymric outpost well, Kern County: Superior 2 Moor, 16-29s-21e, dry at 4,582 ft.

Harbor City outpost well, Los Angeles County: John Schumacher, 1-31 Dines, 31-4s-13w, dry at 3,990 ft.

Jelly Bend wildcat district, Tehama County: Texas 8-18 Jelly Bend, 8-29n-2w, dry at 7,134 ft.

Stratford wildcat district, Kings County: Southern California Petroleum Corp. 88-32 Bergan, 32-19s-20e, dry at 10,448 ft.

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Summary of November Completions*

	Comp.	Oil	Prod.	Gas	Dry	Under 1,000 ft.	1,000-2,500 ft.	2,500-5,000-ft.	5,000-10,000 ft.	Over 10,000 ft.	Total footage	Rigs and drilling
N. Y., Penna., W. Va.	544	239	507	75	†230	48	460	35	1	0	760,452	525
Ohio	83	18	382	41	24	11	25	47	0	0	224,594	194
Indiana	18	7	582	0	11	2	10	6	0	0	33,981	44
Kentucky	93	28	1,973	37	28	11	71	11	0	0	172,980	145
Michigan	51	19	7,952	8	24	0	22	29	0	0	133,945	154
Illinois	203	133	12,019	1	69	7	60	136	0	0	519,055	248
Kansas	152	56	18,763	13	83	2	18	128	4	0	507,629	260
Mo., Iowa, Neb.	4	2	21	0	2	1	1	1	1	0	9,318	7
Oklahoma	185	103	53,019	17	65	7	45	66	67	0	766,227	576
Texas:												
North Texas	108	54	13,402	0	54	16	47	22	23	0	312,356	117
West Central Texas	25	10	3,199	2	13	0	11	14	0	0	65,708	35
West Texas	136	114	59,244	4	18	1	14	67	52	2	643,225	488
Texas Panhandle	36	22	2,137	9	5	0	4	32	0	0	107,336	240
Eastern Texas	26	6	1,371	5	15	2	2	11	11	0	137,818	98
Upper Gulf Coast	76	43	8,335	11	22	0	2	5	66	3	524,293	119
Lower Gulf Coast	53	33	4,848	5	15	0	0	3	49	1	350,346	107
S. C. Texas (San Antonio)	10	3	125	0	7	0	3	6	1	0	34,344	21
South Texas (Laredo)	48	27	3,302	3	18	0	9	25	14	0	198,573	60
Total Texas	518	312	95,963	39	167	19	92	185	216	6	2,383,999	1,285
Louisiana:												
North Louisiana	27	8	2,267	7	12	1	8	9	8	1	123,453	73
South Louisiana	56	35	7,636	5	16	0	0	2	24	30	541,755	114
Total Louisiana	83	43	9,903	12	28	1	8	11	32	31	665,208	187
Arkansas	11	9	1,038	0	2	0	1	2	7	1	69,394	45
Mississippi	27	18	4,661	0	9	0	1	3	21	2	164,819	80
Ala., Ga., Florida	6	1	20	0	5	0	0	3	3	0	31,073	16
Montana	15	9	1,736	2	4	1	9	3	2	0	42,004	113
Wyoming	14	8	3,600	0	6	0	0	11	3	0	62,133	108
Colorado	2	1	480	0	1	0	0	0	2	0	14,674	34
New Mexico	30	23	4,817	2	5	1	5	22	2	0	95,052	140
California	153	125	33,801	4	24	1	30	84	32	6	607,719	280
Total November	2,192	1,154	251,237	251	†787	112	858	783	393	46	7,264,256	4,441
Total October	2,217	1,194	264,331	215	‡808	125	884	838	343	27	7,124,953	4,319

*Four weeks ending November 25. †Includes 216 service wells. ‡Includes 220 service wells.

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OHIO, KENTUCKY

Clayton Extension Makes 78 Bbl. on Test

COLUMBUS.—The Clayton field was extended ⅝ mile to the east by Preston Oil Co. 1 Cookson-Adrain, Section 3, Clayton Township, Perry County. Clinton sand at 3,318 to 3,356 ft. flowed 60 bbl. and swabbed 18 bbl. of oil in the first 24 hours after shot.

The second large producer to be completed in the old Injun field in Ludlow Township, Washington County, made 180 bbl. with 500,000 cu. ft. gas. The completion, Ludlow Oil Co. 1 Abner Dickson, Section 15, found an isolated sand lens.

W. Pfeiffer 1 Tim Burkhart, Section 20, Pike Township, Stark County, gaged 1,247,000 cu. ft. with rock pressure of 1,260 lb. This well will encourage further development in the southwestern part of the township.

H. E. Perkin et al 1 Ida M. Rine, Lot 3, Pleasant Township, Knox County, gaged 1,218,000 cu. ft. in the Clinton at 2,502-20 ft. This is the best completion in this area for a number of years.

OHIO WILDCAT COMPLETION

Licking County, McKean Township: National Drlg. Co. 1 Laura Layman, 4th Qr., Trenton 3,648 ft., dry, TD 4,365 ft., PB to Clinton and completed as a gas well.

EASTERN KENTUCKY

ASHLAND.—Drilling operations were hampered considerably in some areas this week by the heavy snow which was 6 in. deep in most active fields.

Only one completion was reported while several locations were made.

Glenn McCoun completed what was termed a test through the Clinton formation for Ashland Oil & Refining Co. on the Joe Stamper farm at Maytown in Floyd County but only a small showing of gas was reported at 1,804 ft.

WESTERN KENTUCKY WILDCAT COMPLETIONS

Henderson County: Ashland 1 Fannie Royster, 11-O-23, dry at 2,562 ft., Vienna 1,796 ft., Glen Dean 1,921 ft., Barlow 2,187 ft., Ste. Genevieve 2,492 ft. On a 4-hr. drill-stem test of McClosky lime at 2,500-20 ft., developed 980 ft. of oil, 450 ft. of salt water and 100 ft. of oil-cut mud.

Union County: Weinert and Pure Oil 1 Will Clements, 3 mi. S of Uniontown, dry at 2,653 ft., Glen Dean 1,992 ft., Barlow 2,264 ft., Cypress 2,291 ft.

Webster County: Sinclair Prairie 1 Bozart, NW NW SW 21-L-32, dry at 3,823 ft., Glen Dean 2,621 ft., Cypress 2,903 ft., Renault 3,011 ft., Ste. Genevieve 3,160 ft., McClosky 3,198 ft.

INDIANA

EVANSVILLE, Ind.—T. E. Sperry, of Langsenkamp & Sperry, who are wildcatting in Hamilton County, writes that the firm's 2 Joe Newby, in 24-19n-3e, Washington Township, is showing for an oil well in Trenton Rock, total depth 1,063 ft. The firm's first well on the block showed too much water to make it commercially productive of oil, but No. 2, Sperry writes, may be a pool opener. It is reported on one test to have pumped off about 30 bbl. of oil in 2 hours and 45 minutes.

INDIANA WILDCAT COMPLETION

Orange County: Bedford Development Corp. 1 Cora Brothers, NW SW SE 19-3n-2w, dry at 1,310 ft., no log.

WILDCAT COMPLETIONS AND DISCOVERIES

	Week ended Dec. 16, 1944					Cumulative total, 1944				
	Oil	Dist.	Gas	Dry	Total	Oil	Dist.	Gas	Dry	Total
Ohio	0	0	1	0	1	2	0	20	68	90
Indiana	0	0	0	1	1	4	0	0	25	29
Illinois	1	0	1	9	11	41	0	1	331	373
Kentucky	0	0	0	4	4	17	0	0	85	102
Michigan	1	0	0	12	13	13	0	4	242	259
Kansas	0	0	0	12	12	49	0	10	436	495
Neb., Mo., Iowa	0	0	1	1	2	1	0	1	18	20
Oklahoma	3	0	1	5	9	75	1	21	272	369
Texas:										
North Central	4	0	0	7	11	69	0	1	324	394
West	1	0	0	2	3	41	0	3	171	215
Panhandle	0	0	0	0	0	0	0	2	10	12
Eastern	0	0	0	1	1	6	0	5	117	128
Gulf Coast	0	0	0	3	3	35	12	15	224	286
Southwest	0	0	0	2	2	23	4	16	225	268
Total Texas	5	0	0	15	20	174	16	42	1,071	1,303
Louisiana:										
Northern	0	0	0	0	0	6	2	2	57	67
Southern	0	0	0	0	0	10	6	1	45	62
Total Louisiana	0	0	0	0	0	16	8	3	102	129
Arkansas	0	0	0	3	3	2	1	0	57	60
Mississippi	0	0	0	2	2	4	0	0	68	72
Ala., Ga., Florida	0	0	0	1	1	2	0	0	31	33
Montana	0	0	0	2	2	4	0	4	50	58
Wyoming	2	0	0	0	2	21	0	2	28	51
Colorado-Utah	0	0	0	1	1	3	0	1	28	32
New Mexico	2	0	0	2	4	9	0	3	57	69
California	0	0	1	4	5	7	0	10	179	196
Total United States	14	0	5	74	93	444	26	122	3,148	3,740
Total previous week	10	0	2	85	97					

CANADIAN FIELDS

Jumping Pound Test Drilling Porous Zone

CHATHAM, Ont.—Shell Oil Co. of Canada 4-24-J, LSD 4, 24-25-5w5, deep test on the Jumping Pound structure in the foothills west of Calgary, with Madison contact at 9,618 ft. is coring a porous zone, believed to correspond to the upper porous of Turner Valley, below 9,746 ft., after drill-stem test below the Madison contact showed gas with neither oil nor water. Drill-stem test of the present zone will be made when hard lime is reached.

Vermilion.—Vermilion Consolidated 15 deep test, LSD 6, 12-49-6w4, south of the main field, exploring Devonian limestone, is testing at 4,031 ft. after drilling through a possibly commercial salt bed at 3,841 to 3,900 ft.

LA.-ARK.

Lake St. John Field Shows Week's Largest Well

SHREVEPORT.—Seven wells were completed in the North Louisiana division during the week in review, two oil wells, three gas wells and two dry holes. The best of the oil wells was a 320-bbl. producer, California Co. 1 Marks Realty Co., in the Lake St. John field, Concordia Parish. Aggregate new gas production was about 229,000,000 cu. ft. of gas.

The best new well reported in Arkansas during the week was Mid States Oil Corp. 1 George-Reed Unit, 1,007 ft. north and 766 ft. east of SW cor. NE 34-19-20, Haynesville extension, Columbia County, which flowed 710 bbl. per day through perforations at 5,606-20 ft., which had been acidized, total depth 5,681 ft.

Two deep dry holes were reported from the Dorcheat-Macedonia field in Columbia County. Root Petroleum Co. 1 Union Saw Mill, C NW NW 27-18-12, a wildcat in Union County, was pumping 25 bbl. per day while testing.

ARKANSAS WILDCAT COMPLETIONS

Ashley County: Lion 1 Betty, NE NE 29-17s-4w, dry, TD 3,006 ft.

Columbia County: G. H. Vaughn 1 Jackson, SE SW 8-16s-21w, dry, TD 7,562 ft., Smackover lime 7,395 ft.

Union County: Phillips 1 Callie, 658 ft. south and 553 ft. east of NW cor. 30-18s-12w, dry, TD 5,010 ft.

MISSISSIPPI

Wildcatters Extend Their Mississippi Operations

JACKSON, Miss.—Five Mississippi wildcat locations were made during the week in review, and nine locations were made in Mississippi fields under development.

In the Heidelberg field Fohs Oil Co. will drill 1 J. Lightsey, SW cor. SE SW 18-1n-13e, and Frankel and Gulf Refining Co. will drill 1 S. Dowling-Dantzler, 1,000 ft. north and 330 ft. east of C 3-10n-10w, thus giving a play to the northwest and southwest ends of the field.

In Adams County California Co. 1 Alice Ratcliffe in the Cranfield pool in 68-7n-1w, was completed from the basal part of the Massive sand with 7-in. casing perforated at 10,325-53 ft. Completion gage was not yet available. No. 2 Ratcliffe has derrick up and No. 3 is shut down for rig repairs with the hole at a total depth of 10,009 ft.

MISSISSIPPI WILDCAT COMPLETIONS

Attala County: Erle P. Halliburton, Inc. 1 Hester, NE NW NE 28-14n-5e, dry, TD 5,435 ft., Tuscaloosa 4,104 ft.

Jasper County: Frankel Brothers 1 Masonite, NE NW 21-1n-13e, dry, TD 7,370 ft., Lower Cretaceous 7,212 ft.

ALABAMA WILDCAT COMPLETION

Choctaw County: Hunt Oil 1 Smith Lumber Co. et al, NE SW 11-10n-4e, dry, TD 5,396 ft.

Here's that Baker JUNK PUSHER you should use next time you run a BAKER Cement Retainer. You can find out why the Baker Junk Pusher is so important on Page 337 of the BAKER (or Composite) catalog.

Among the Drilling Contractors

Mouser Drilling Co. has the contract to drill the Gough Davis and J. A. Aylward Production Co. 1 Mares, in NW NW NE 13-15-11w, Russell County, Kansas. The wildcat is northwest of the Stoltenberg pool. Stanolind Oil & Gas Co., Phillips Petroleum Co., and Gulf Oil Corp. are supporting the test.

Mealy-Wolfe Drilling Co. was moving in a rig to drill the Dudley D. Morgan and associates 1 R. E. Garrett, location for which has been staked in NW NW NW 34-16-4e, Lincoln County, Oklahoma. The Prue sand will be the first objective.

Parker-Duerr Drilling Co. was moving in tools to location on the Hanlon & Buchanan, Inc. 1 Heiring, in SE SE SE 18-19-2e, Payne County, Oklahoma. Location was announced late in November, and drilling will get under way soon.

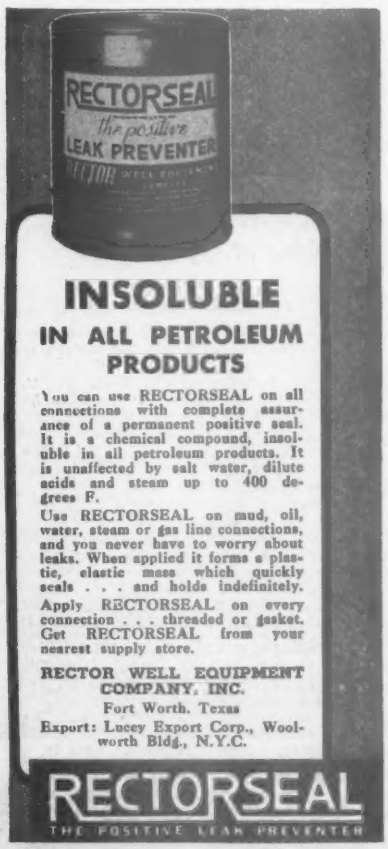
Oil Ventures, Calgary, Alta., sponsored by Neil McQueen and associates, has contract to handle all testing and completion work for Pacific Oil & Refinery wells in southern Alberta.

Howard P. Holmes, president of **Two States Drilling Co.,** and also president of American Association of Oilwell Drilling Contractors, addressed the Dallas Petroleum Engineers Club last week on current drilling problems.

Big Chief Drilling Co.'s president, W. T. Payne, is president of the Oklahoma City Chamber of Commerce's oil and gas committee, which sponsored a special forum luncheon last week for representatives of the petroleum and allied industries. W T. Holliday, president of Standard Oil Co. of Ohio, was guest speaker.

Thomas P. Pike and A. S. Hayes of Los Angeles, and E. C. Brown, Thomas M. Rowan, and Earl Kellogg, of Long Beach, were recently elected regional directors of American Association of Oilwell Drilling Contractors.

Newell & Chandler, of Calgary, Alta., have a contract for a joint test for Imperial Oil and Federated Oil, to be drilled in LSD 16, 5-18-2w5,



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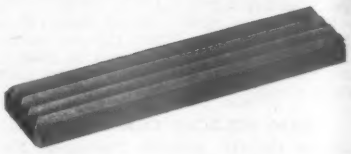

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SEE COMPOSITE CATALOG
PAGES 3101 TO 3120

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RUGGED—Sturdy conventional construction permits ready repairs in the field by any good mechanic—if ever necessary.
PORTABLE—Completely self-contained, with oil-sealed gauge, diaphragm unit, pulsation damper and vernier mechanism built right into the heavy brass case. Quick action coupling permits fast installation.

MARTIN-DECKER CORP.
LONG BEACH, CALIFORNIA
A. F. McQUISTON, BAKERSFIELD, CALIFORNIA
REED ROLLER BIT CO., HOUSTON, TEXAS

in the southwest extension of the Turner Valley field. Test will be known as Imperial-Federated 1.

Phinney Brothers have been awarded drilling contract on the Harris Oil Co. 1 John and Hattie Schaap, in NE NE NW 3-4n-15w, Allegan County, Michigan.

J. W. Lang is the drilling contractor on the Alan W. Winchester 1 Julius and Levi Knobloch, in NE SW SW 22-3n-13w, Allegan County, Michigan.

E. V. Hilliard will drill the J. V. Wicklund Development Co. O-1 State of Michigan, in NE NE SW 6-19n-4e, Arenac County, Michigan.

Merrill Drilling Co. is the contractor on the H. E. Walton and W. B. Stewart 1 S. Koziak, in NW NW SW 15-19n-4e, Arenac County, Michigan.

Union Drilling Co. will drill the H. E. Walton and W. B. Stewart 1 Klimek, in SE NW NE 16-19n-4e, Arenac County, Michigan.

Muskegon Development Co. is the contractor on the United Drillers & Producers, Inc., 6 Maurice A. and Flora B. Arms, in C NE SE NE 12-14n-5e, Bay County, Michigan.

Ed Shields will drill the Chartiers Oil Co. 1 Girvin-Childs Comm., in C N½ NE NW 19-13n-3w, Isabella County, Michigan.

Union Rotary and Muskegon Drilling Co. will drill the Chapman Oil Co. 1 Gertrude Burns, in C N½ SE SW 5-15n-9w, Mecosta County, Michigan.

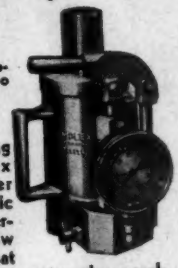
E. V. Hilliard is the contractor on the J. V. Wicklund Development Co. 1 Harry Comment, in SE SE NW 3-14n-10e, Tuscola County, Michigan.

J. W. Spencer is the contractor on the Walter A. L. Elliott 1 W. Fleckenstein, in SW NE SW 23-1s-15w, Van Buren County, Michigan.

General Petroleums, of Calgary, Alta., has completed Great Bend Oils 1 LSD 4, 28-52-3w4, in the Marwayne area northwest of Vermilion, and is moving the outfit to complete its own well in the Vermilion field. The same company is completing No. 3 well for Bata Petroleums in the Unity field of western Saskatchewan.

Newell & Chandler of Calgary are drilling below 2,835 ft. on Empire Petroleums 1, LSD 7, 11-19-11w4, in the Steveville-Princess field east of Calgary.

Do 24 Hour Jobs in 3 Hours with a Simplex Jenny!



Five models; capacities 30 to 100 tons.

One man using the Simplex Jenny Center Hole Hydraulic Puller can perform in a few hours jobs that formerly took over two days working with old methods. It turns hours into minutes when pulling bushings, cylinder liners, pistons, valve seats, wrist pins, keys, wheels, sprockets, gears, boiler tubes, pipes, etc. Also pushes or lifts, and can be used as a portable press. Ask for Bulletin 43J

Simplex
LEVER SCREW - HYDRAULIC
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Templeton, Kenly & Co.
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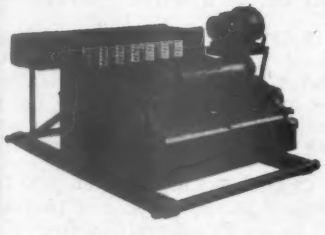
Better, Safer Jacks Since 1899

McNEELY VIBRATING MUD SCREEN



Handles the output from 20" mud pumps after surface hole is drilled. Average capacity 650 gallons per minute. Completely unitized. Screening surface—16 square feet. Domestic shipping weight less drive—1600 pounds. Headroom—27 inches. See Composite Catalog or write for details.

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GULF COAST AND MID-CONTINENT REPRESENTATIVE
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PENBERTHY "REFLEX" WATER GAGE SET

For oil field, locomotive type and marine boilers. Water shows black — steam shows white; the water level is unmistakable. U-Bolt construction is strongest and simplest to service. Glass replaced by simply removing nuts on face of gage . . . unnecessary to work between gage and boiler. Conforms with A.S.M.E., Federal and State requirements when used for pressures specified by their respective codes.

This is one of the complete line of Penberthy gages that meet every liquid level gage requirement.

PENBERTHY INJECTOR CO.
DETROIT, MICH. Canadian Plant WINDSOR, ONTARIO

PERSONALS

Fealty to Tasks Led Him to Top Refinery Post

CECIL E. CARSON, general manager of refineries for Imperial Oil, Ltd., at Toronto, Ont., entered the service of that company in 1923 as a junior chemist at the Montreal refinery.

Two years later he became assistant to the chief chemist, and he remained in that position until April 1928, when he was advanced to process foreman. Nine months later he was promoted to assistant refinery superintendent. In September 1933 he was appointed superintendent of the company's plant in Regina, Sask. One year later he was transferred to the Sarnia refinery, in Ontario, as general superintendent, and that was his position for a decade, held until the responsibilities of general manager of refineries were laid upon him.

Carson was born December 17, 1900, in Montreal, and attended McGill University in that city, graduating in 1922 with a bachelor of science degree in chemical engineering.

Herman P. Little, chief chemist and repressuring engineer for South Penn Oil Co., has been transferred from Pittsburgh to Bradford, Pa.

Walter A. Goldtrap has been added to the staff of the chemical products department of Phillips Petroleum Co., Bartlesville, Okla. Goldtrap has been associated with Atlantic Refining Co., Philadelphia, and with Arthur G. McKee & Co. in Cleveland. He was formerly chief engineer of Blaw-Knox Construction Co., Pittsburgh, and was project manager for Firestone Tire & Rubber Co. during construction of the 60,000-ton copolymer unit at Lake Charles, La.

J. C. Hunter, Abilene, Tex., was reelected president of Mid-Continent Oil and Gas Association last week. Renamed also were **F. M. Porter,** Oklahoma City, vice president, and **Clarel B. Mapes,** Tulsa, general secretary. State vice presidents were chosen as follows: Oklahoma, **E. F. Bullard,** Tulsa, president Stanolind Oil & Gas Co.; Kansas, **E. B. Shawver,** Wichita, independent operator; Texas, **George Gibbons,** Dallas, executive vice president Texas division of the association; Arkansas-Louisiana, **D. W. Harris,** Shreveport, president Arkansas Louisiana Gas Co.; New Mexico, **Van S. Welch,** Artesia, independent operator; Mississippi-Alabama, **C. L. Morgan,** Jackson, independent geologist.

W. H. Burke, division manager of production; **C. M. Harris,** division geologist, and **Hugh Dickson,** division land agent, will be in charge of their respective departments in the new office which Shell Oil Co., Inc., is opening in Oklahoma City for its Oklahoma division. The division office formerly was in Tulsa.

Dr. Charles Lathrop Parsons, Washington, for 37 years secretary of American Chemical Society, and formerly chief chemist of U. S. Bureau of Mines, received on December 17 the honorary degree of doctor of science from University of New Hampshire, where from 1892 to 1911 he was a professor of chemistry. Dr. Parsons graduated from Cornell University in 1888. He was chief mineral chemist of the Bureau of Mines from 1911 to 1916, and chief chemist from 1916 to 1919. Since 1919 he has been consulting chemist to the nitrate commission.

Ben E. Parsons, vice president of General Petroleum Corp. of California, has been made a member of the board and director of production. **Max App,** assistant to the manager of the production department, has been advanced to manager. **Bruce H. Robinson,** superintendent of the southern division, has been made general superintendent of production and **R. R. Shinn,** division superintendent of the San Joaquin division, has been promoted to assistant general superintendent of production. **E. J. Carnahan,** production superintendent of the southern division, became southern division superintendent. **D. G. Kingman,** production superintendent of the San Joaquin division, was promoted to division superintendent.

T. T. Galloway, industrial relations supervisor for Creole Petroleum Corp. in the Jusepin district of eastern Venezuela, is returning to his post after attending a conference in Tulsa with officials of The Carter Oil Co. Galloway, who has been in South America 5½ years, left for Venezuela by plane December 15.

W. R. Barclay, who was with Darby Petroleum Corp. before it was acquired by Sunray Oil Corp., is now in charge of leasing and scouting for Darby & Bothwell, Inc., independent operators of Tulsa.

Curtis M. Smith, for several years in the industrial relations and personnel department of Shell Oil Co., Inc., Houston, has joined Tennessee Gas & Transmission Co. as assistant personnel director. Smith is a graduate of University of Oklahoma.

William B. Barfield has resigned as assistant to the purchasing agent of British American Oil Producing Co., Tulsa, to join Sinclair Prairie Oil Co. as a safety engineer.

S. F. Shaw will soon complete some gas-lift installations in the Saxet field, Texas, and then will be in eastern Wyoming for the remainder of December while checking some oil properties.

Charles B. Carpenter, of U. S. Bureau of Mines, was elected president of Dallas Petroleum Engineers Club at its annual meeting. **Jack P. Hays,** Seaboard Oil Corp., was chosen first vice president; **E. J. Wacker, Jr.,** Magnolia Petroleum Co., second vice president; **Ralph U. Maddox,** Grady Vaughn Co., third vice president. **J. Walter Black,** Magnolia Petroleum Co., was reelected secretary-treasurer.

E. B. Miller, district production engineer, Tide Water Associated Oil Co., of Kilgore, Tex., has been made chief production engineer, Mid-Continent division, with headquarters at Houston. He succeeds George L. Nye, who has resigned to accept a

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Use the power of steam, air or water under pressure to lift liquids. Being simple jet pumps they have no moving parts and require no lubrication. A variety of models to meet different conditions. Also used as water heaters.

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FOR CHANGING FORMATIONS

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Four different cutting actions directed at bottom and sides of hole. Features safety and simplicity, trouble free drilling. See Composite Catalog or Bulletin and Prices upon request.

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position with the City National Bank, Houston, as petroleum advisor. Miller has been associated with the company 10 years, being district production engineer in the K.M.A. field prior to being moved to Kilgore. Nye had been with the company 16 years.

Amos Ball, for 48 years in the service of Standard Oil Co. (Indiana), will retire January 1 as a director and vice president in charge of sales. His retirement starts a train of promotions. **Roy F. McConnell,** now general manager of sales, will move into the vice presidency, and **H. E. Hanson,** now ranking assistant general manager, will become general manager of sales.

Dan S. Johnston was recently appointed drilling superintendent for Signal Oil & Gas Co. with headquarters at Long Beach, Calif.

Jack Menish, formerly of Wichita, Kans., has joined Stanolind Oil & Gas Co. as geological scout in its Midland, Tex., office. He graduated in geology from University of Kansas. **L. C. Lindeblade,** subsurface geologist for the company, has been made a member of the Midland staff.

C. O. Davis, formerly superintendent for Pure Oil Pipe Line Co. in the Muskogee, Okla., district, has been transferred to Mount Pleasant to serve as assistant to the general manager of the company's Michigan division. Davis has been with Pure more than 20 years.

John A. McNair has been appointed attorney for The Texas Co. on the Pacific Coast, succeeding **Charles C. Stanley,** who retired December 1, but will continue with the company in an advisory capacity.

George B. Davies, Jensen Petroleum Co., was chosen president of Chicago Oil Men's Club at the recent annual meeting. **Henry G. Plane,** Johnson Oil Refining Co., was elected vice president; **M. W. Prellberg,** James B. Berry Sons Co., secretary; **R. P. Baker,** Pure Oil Co., treasurer.

Bruce K. Brown, who recently resigned as assistant deputy petroleum administrator, was reelected last week a director of Standard Oil Co. (Indiana). As an operating executive he again becomes general manager of the company's research and development work.

John R. Suman, Houston, vice president of Humble Oil & Refining Co., has been chosen regional vice president of National Association of Manufacturers.

SLINGS CAN'T SLIP OFF!

Laughlin Safety Hooks have a unique latch designed to prevent loads from slipping or jolting off the hook. Green workers can work with less fear of accidents . . . older hands will appreciate this safety feature. Laughlin's Safety Hooks are made of heat-treated, drop-forged steel.

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Laughlin offers you the most complete line of hoist hooks on the market, and there are standard Laughlin fittings for almost any other requirement.

ROPE SOCKETS

Rope sockets of drop-forged steel are available in sizes ¼" to 1¾" (open pattern) and sizes ¼" to 1¾" (closed pattern), plain or galvanized finish.

WELDLESS TURNBUCKLES

Weldless Turnbuckles are available in all types and sizes from ¼" x 4" to 2½" x 36". The largest turnbuckle ever made by drop-forging was produced by Laughlin . . . a giant of 440 pounds for a 50 ton boom.

Laughlin's latest catalog shows the complete line of Laughlin Wire Rope Fittings. Send for it.

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Look for Laughlin Products in Composite Catalog

FORGING A SHARE IN VICTORY

THE THOMAS LAUGHLIN Company
PORTLAND 6, MAINE

Equipment Men in the News

Ad Series Pays Tribute To Women Workers

In a new series of morale-building, full-color advertisements planned to stimulate the war effort, Mission Manufacturing Co. is currently paying tribute to the important part women are playing in the work of the petroleum industry.

Featured as "Miss Mission" the central figure in this series of natural-color photographs, is Jane Randolph, attractive Republic cinema star originally from the steel center of Youngstown, Ohio, whose own heritage makes her as much at home in industrial scenes as in the motion-picture sets of Hollywood. Her father, an industrial engineer, supervised the construction of the Kokomo Steel & Wire plant and the Superior Sheet Steel mill in Indiana; her uncle, Henry A. Roemer, worked up through the ranks to presidency of Pittsburgh Steel Corp.

Miss Randolph too has risen in her theatrical career by persistence and long hours of earnest work. Recent features in which she has played include "A Sporting Chance," "In the Meantime, Darling," the "Cat People" series, and "Jealousy" in which she portrayed a young woman welder. Her casting seems particularly appropriate in the "Miss Mission" series of advertisements where she epitomizes the spirit of women war workers of America whose skill, energy, and high patriotism are contributing so much toward victory.

Hendy Announces Diesel Sales Unit

G. C. (Jerry) Rasey has been named supervisor of the marine and stationary diesel division of the general sales department at Joshua Hendy Iron Works, Sunnyvale, Calif., with Lawrence H. Earle and Louis Kaiser as his assistants.

Before joining the Hendy organization, Rasey was West Coast representative of Murphy Diesel Co., Milwaukee, Wis.

Earle was previously with the diesel division of National Supply Co., at the Philadelphia plant of which he was successively sales manager, head of the service department, advertising manager, and assistant plant manager.

Kaiser has spent the past year in the Hendy turbine shops. He came to Hendy after 23 years with the Honolulu Iron Works, Honolulu, T. H., where he served as sales and service engineer.

Krieger Returns to Ethyl Corp.

George Krieger, who has been in charge of the farm-machinery division of the War Production Board and recently special assistant to Donald M. Nelson, has resigned and will return to Ethyl Corp.

Before joining WPB in November 1942, Krieger was head of the agricultural division of Ethyl Corp.'s technical service department with headquarters in Detroit. In his new position he will be in charge of rural marketing and special development work as assistant to Julian J. Frey, general sales manager.

Dickey Appointed Chief Engineer Of Bailey Meter Co.

Bailey Meter Co., Cleveland, Ohio, announces the appointment of P. S. Dickey as chief engineer. Dickey will supervise

P. S. DICKEY

H. H. GORRIE

all engineering, research and design activities for the company. He will be assisted by H. H. Gorrie, assistant chief engineer, and R. E. Clark, manager of contract engineering.

In his former position of research engineer, Dickey conducted numerous studies on the problems involved in the control of both forced and natural circulation boilers in stationary, marine, and mobile service.

Gorrie, who has been appointed assistant chief engineer, has been associated with Bailey Meter Co. continuously since 1927. He was formerly manager of the company's San Francisco branch office, and later head of the company's control engineering department.

Heath Named to Export Post With Le Roi Co.

Le Roi Co., Milwaukee, Wis., announces the appointment of Russell D. Heath of New York City, as export petroleum industry representative.

Heath was formerly connected with the Westinghouse Electric International Co. for over 20 years, in charge of export petroleum and mining industry sales. He has traveled extensively in South and Central America, and is intimately familiar with petroleum operations in Mexico, Trinidad, Venezuela, Colombia, Ecuador, and Guatemala.

Aluminum Co. of America Names Three to Development Division

The sales engineering and development division activities of Aluminum Co. of America are being expanded with the appointment of three men to head up special activities. Frank Jardine, who has been in charge of development work in Cleveland, has been given the title of manager of development division, Cleveland branch. John R. Willard has been placed in charge of the sales development division located at New Kensington, Pa., and B. J. Fletcher has been appointed chief engineer of the New Kensington branch. All three will report to R. V. Davies, assistant general sales manager.

Swift Opens New York Office

Dean Swift, formerly of Seattle, Wash., announces the opening of offices in New York City. He will represent the Western Gear Works' plants at Seattle; Lynwood and Vernon, Calif., and Western Gear's associate plant, Pacific Gear & Tool Works of San Francisco.

Western Gear products include speed reducers, marine propulsion units, cranes and crane machinery, winches, hoists, deck machinery, capstan gearing, airplane gears and actuating units, ship lighting sets, various types of transmissions and oil-field pumping equipment. Swift's offices are located in the Chanin Building, Forty-second and Lexington.

Conway Heads Petroleum Division of Lukens Steel and Subsidiaries

Martin J. Conway has been appointed manager, petroleum division of Lukens Steel Co. and subsidiaries, By-Products Steel Corp. and Lukenweld, Inc.

Conway was born in England in 1893. From 1914 to 1920, except for the war years when he served the Government, he was in charge of tar distillation and byproducts operation at Blaenavon Iron & Coal Co., Ltd.; concurrently he was a consulting engineer handling distillation plants for Frazer & Co. Both concerns are located in England.

In 1920, he joined Pittsburgh Crucible Steel Co., Midland, Pa., as fuel engineer and in 1923 he entered the employ of the Steubenville, Ohio, plant of the Wheeling Steel Corp. in a similar capacity. He joined Lukens Steel Co. in 1926 as fuel engineer and continued in that capacity until 1940 when he transferred to the sales department as special engineer.

Wiley Becomes Consultant for Big Three Welding Equipment Co.

George L. Wiley has joined the Big Three Welding Equipment Co. at Houston, Tex., as welding consultant.

The company, with offices also at Fort Worth, El Paso, Orange and San Antonio, is the Texas distributor for Lincoln Electric Co., Cleveland, Ohio.

Wiley has been promoting the use of electric arc welding for the past 26 years. He was the founder of the first Fusion Forum, has held committee chairmanships in both the American Welding Society and the American Society for Metals.

Kimball Joins Louisiana Supply

Charlie Kimball has joined the sales organization of Louisiana Supply Co., Sulphur, La.